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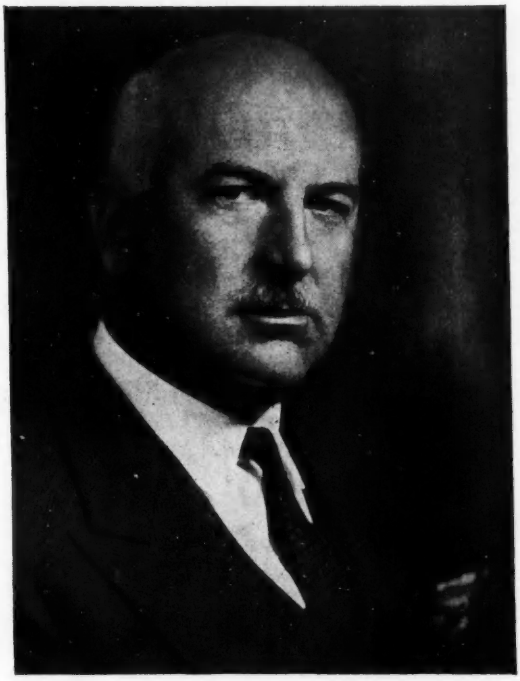
* To be published later.

HOWARD SHEFFIELD JECK, M.D.

We announce with deep regret the death of Howard Sheffield Jeck, M.D., of New York City on December 29, 1949 at the New York Hospital, at the age of sixty-six of cerebral hemorrhage.

Born at Nashville, Tenn., Dr. Jeck received his medical degree at Vanderbilt Medical School from which he graduated in 1909.

He was associate professor of clinical surgery (urology) Cornell University Medical College and professor of urology at the New York Polyclinic Medical



School and Hospital; specialist certified by the American Board of Urology; member of the American Urological Association; fellow of the American College of Surgeons; past president of the Bellevue Alumni Association; affiliated with Dobbs Ferry (N. Y.) Hospital, Good Samaritan Hospital, Suffern, Nyack (N.Y.) Hospital, Rockland State Hospital, Orangeburg, St. John's Hospital, Brooklyn, White Plains (N. Y.) Hospital, Bellevue Hospital and New York Polyclinic Hospital; served on the staff of the New York Hospital. He was elected a member of the American Association of Genito-Urinary Surgeons in 1928. Since that time he has been an active and valued participant in our meetings. We will all miss his charming and kindly personality.

It is hereby moved that a copy of this obituary be entered upon the books of the Association and be sent to his widow.

B. S. Barringer, M.D.

PRESENTATION OF KEYES MEDAL TO DR. HERMAN L. KRETSCHMER

DR. WILLIAM F. BRAASCH: In order to appraise Herman Kretschmer's qualifications for the Keyes Medal and in order to appreciate the stature of the man, I shall review briefly his activities from the many angles of his medical career.

Let us first consider his scientific contributions to urology. Dr. Kretschmer's interest in the scientific approach to urology was stimulated during his post graduate studies in Vienna and other European medical centers shortly after his internship. While working with such leaders as Stoerck, Zuckerkandl and Weichselbaum, he realized the necessity of basing clinical urology on a thorough knowledge of pathology of the genito-urinary tract. In fact, he has maintained ever since that the urologist should be able to make his own pathologic diagnosis and what is more he has put that theory into practice. His thorough knowledge of pathology has served as the basis for most of his writings. His first paper was written after completing a research project on essential hematuria in the Pathological Institute of Vienna. The results of this research were published in the first volume of *Zeitschrift für Urologie* under the title of "Beitrag zur Frage der Essentiellen Nierenblutung." Since then Dr. Kretschmer has contributed some 300 papers to urologic literature. These have been characterized by simple and direct wording, based on wide experience and keen observation. If he differed from an author's opinion, he was not slow in stating so in vigorous terms. It should be noted that many of his papers of 20 to 35 years ago were written on subjects then considered as advanced or controversial. His ideas often changed opinion and led the way.

As previously stated, prominent among his contributions to urologic literature have been his various papers based on pathology of lesions in the urogenital tract. Included in this group are many treatises on renal neoplasms stressing the unusual types of nonmalignant as well as malignant tumors. Reference is often made to his writings on leukoplakia in the urinary tract. Included in renal pathology is his widely quoted paper on renal carbuncle. His article entitled "Spinal Cord Bladders Occurring in Pernicious Anemia" may also be mentioned among his outstanding works since he was the first to describe that lesion. His papers on the shadowgraph catheter written with L. E. Schmidt in 1910 were contemporary with the early reports on urography. Many of his writings concerned urinary lesions in childhood. In fact his first paper was written with Dr. H. F. Helmholz 30 years ago when neither urologists nor pediatricians appreciated the importance of these lesions. He was greatly interested in renal tuberculosis, and beginning in 1919 wrote 8 articles on various phases of this disease. References are often made to his contributions to the subject of pyelitis of pregnancy which are illustrated with urographic studies. He was among the first to report on "Periostitis and Osteitis Pubis Following Suprapubic Prostatectomy" (1930). Included in his research studies is one article entitled "Physiological Response of Transplanted Prostatic Tissue in the Anterior

Chamber of the Eyes of Rabbits," which he wrote some 15 years ago. In the field of general medicine two of his papers; namely, "Life After Nephrectomy" and "The Teaching of Drug Therapy", published in 1944 in the *Journal of the American Medical Association*, aroused wide interest.

When Lewis' *Practice of Surgery* was first published, he was appointed editor of the section on urology and he has held that position ever since. He also has contributed chapters on the same subject to the following publications: *Obstetric Medicine*, by Adair and Stieglitz; Christopher's *Textbook of Surgery*, and *Practice of Pediatrics* by Dr. Joseph Brennemann. He was editor of the *Manual on Surgery of the Genito-urinary Tract* during World War II. He was a member of the Board of Advisory Editors of the Army Medical Library and was also a member of the National Research Council.

The scientific character of his work has been recognized by several universities. In 1914, his alma mater, Northwestern University, conferred upon him the degree of Doctor of Science. He also received the degree of Doctor of Science from Marquette University. In 1944, he was invested with the Cross of the Legion of Honor of France in recognition of his scientific achievements. He was made an honorary member of a number of foreign urologic societies including those of Hungary and Germany. He has served as president in every national American urologic society. During his term as President of the American Association of Genito-Urinary Surgeons he appointed a committee to draw up plans for the establishment of the American Board of Urology. Although there was some opposition to recognition of this board as independent from the Board on General Surgery, it was so established. Dr. Kretschmer became chairman of the board and served in this capacity for many years. In his Presidential Address before the American Urological Association, he recommended the establishment of a Cancer Registry for tumors of the bladder, an activity which has been carried on successfully over the years. For many years he was a member of the editorial board of the *Journal of Urology*.

Dr. Kretschmer has always taken a positive and forcible attitude in furthering the best interests of urology in America. Many younger urologists do not realize the bitter struggle which has taken place in forcing recognition of urology as an independent clinical and surgical field. When Dr. Kretschmer first began to practice urology he found himself surrounded by a group of general surgeons who opposed his efforts, but by sheer persistence and determination, he, together with other pioneer urologists, gradually established the independent position of this specialty. Not long after returning from his European studies he received an appointment as the first urologist on the staff of the Presbyterian Hospital, Chicago. His urologic clinic there has been outstanding and has attracted countless visitors. Later he became head of the Department of Urology at the Children's Memorial Hospital and at other Chicago hospitals.

Dr. Kretschmer has not been content to confine his interests entirely to his specialty. He realized early the need of every physician to take an active part in the economic problems of American medicine and he has often urged urologists to do so. When he was elected President of the Chicago Medical Society he was

instrumental in establishing the first committee on "Medical Economics." He embodied the activities of this committee in two volumes of reports, which were favorably received and have been widely used for governmental references. For many years, he gave much of his time to his duties as Treasurer of the American Medical Association and later was honored by the presidency of the association. In fact he was the first and only urologist to become President of the American Medical Association. His eminent position in the profession and his popularity were recognized also when he became President of the International Post-Graduate Assembly of North America. Only recently he served as President of the Chicago Institute of Medicine. He has devoted much time and energy in recent years in defense of American medicine and in combating its socialization, through numerous articles and by means of addresses over the radio. In all of these activities he not only has represented organized medicine but he also has acted as an emissary of urology as well.

Herman Kretschmer, because of your countless contributions to the welfare and progress of urology as well as to medicine in general it gives me the greatest pleasure to present this medal to you, an honor which you so richly deserve.

DR. KRETSCHMER: May I thank the society and its members, who by unanimous action last year voted to award me the Keyes Medal.

I need not review the achievements of the founder of this society, in whose honor this award was established. The achievements of this great urologist have been set forth on previous occasions. I feel that it is a great honor to be the recipient of this award and to be associated thereby with the illustrious men who have received it in the past, namely Drs. Richards, Keyes, Young and Bugbee. This award has great significance for me, having been bestowed by a group of the outstanding urologists of this country: men with whom I have worked for 40 years. This is truly a great tribute and one that I shall cherish.

NEPHROPEXY

GEORGE R. LIVERMORE

The numerous operations that have been devised for the relief of ptosed kidneys seem to indicate that no one of them is entirely satisfactory.

At the 1925 meeting of the American Urological Association in St. Louis, I attended the clinic of Dr. C. E. Burford. He was demonstrating the Kelly operation for nephropexy which he stated had been very successful in his hands. He operated upon 2 cases, then showed us a post-mortem specimen taken from a woman upon whom he had operated several years previously and who had recently died from pneumonia. The specimen showed the kidney firmly anchored to the twelfth rib.

We know many urologists say the Kelly operation is wrong because it anchors the kidney, which is a movable organ, firmly to the twelfth rib. Regardless of this, and the post-mortem specimen of Dr. Burford proves that this operation does fix the kidney firmly to the twelfth rib, I have found the operation most satisfactory in a series of 52 cases. It is true that some patients will complain of a dull ache in the loin following the operation, but this usually subsides in a few months. In fact, I have not seen a case in which it did not subside in time. In these 52 cases there were 48 women and 4 men. The ptosis occurred on the right in 48 cases; on the left in 4. In women it involved the right kidney in 46 cases, the left in 2; while in men it involved the right in 2 and the left in 2. See figures 1, 2 and 3.

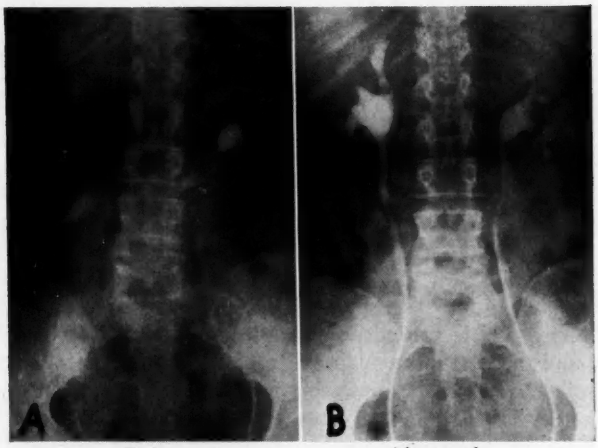
ETIOLOGY

The cause of movable kidney is a disputed question. In lawsuits with a history of blows or falls involving the renal area, the attorney for the plaintiff invariably tries to prove that the injury caused the movable or floating kidney. We urologists know that an injury violent enough to displace a kidney would cause rupture before it caused displacement. It occurs more frequently in women than in men. Southam says it occurs 12 times as frequently and in Bell's series there were 300 cases in women and only 10 in men. Loss of weight and absorption of the perirenal fat are, in my opinion, a frequent cause. We however, see movable kidneys in well developed persons. I should say the chief cause of movable kidneys is a violet strain at work or play (especially that which occurs in foot or basket ball) which loosens the kidney slightly from its perirenal fat. At each succeeding strain the motility is gradually increased until finally there is a movable or floating kidney.

SYMPTOMS AND SIGNS

Dull ache or dragging pain in the loin, usually with renal colic at intervals, is the most prominent symptom. In some cases the colic is relieved when the patient lies down. Frequency, burning and nocturia are periodic symptoms. Intermittent hematuria due to inflammation and congestion of the dilated pelvis and ureter, from back pressure, may be a prominent symptom. Various nervous

manifestations, especially in women, are frequent complications. This is attributed to the drag on the kidney pedicle, plus the pain and infection. Pus and red



Before Afterwards

FIG. 1

Before Afterwards

FIG. 2

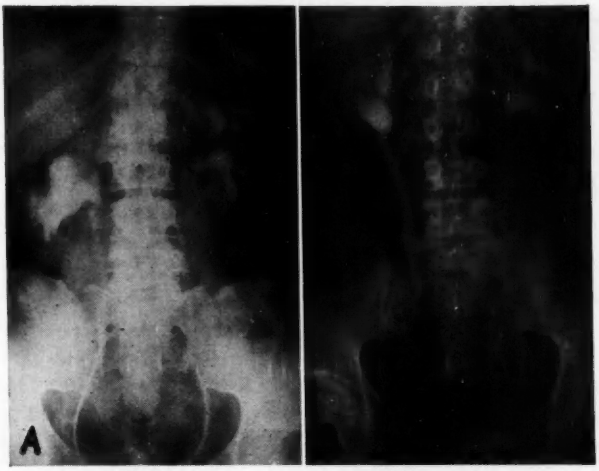
blood cells usually are found in the urine, though cases of long standing often show only a rare leukocyte, which most men consider normal urine.

TECHNIQUE

Kelly's method, as demonstrated by Burford, anchors the kidney to the twelfth rib, one suture above and one below the rib. The sutures are silk in infected

cases and No. 1 chromic catgut in noninfected ones. They are passed through the capsule in a circular manner, the so-called 3 point stitch. We use only one suture of 00 chromic gut and this near the lower pole, owing to the ease with which the suture in the capsule can be torn out; the support of the kidney is reinforced by the Deming operation. It is not necessary to use more than two sutures in doing the Deming operation and usually one is sufficient. We only want this extra support to aid in holding the kidney in position until firm adhesions have formed. I have been so pleased with this operation I now use it almost routinely.

All cases of nephroptosis should not be subjected to operation. Age is not a contraindication. Elderly people usually weather nephropexy exceptionally well. The physical condition, however, must be very carefully checked and, as in all



Before Afterwards

FIG. 3

kidney surgery, a knowledge of the condition and function of the other kidney is a prerequisite. If there are no gross anomalies that we believe cannot be corrected and there is definite evidence that the malposition is damaging the kidney, and infection persists, or the patient suffers pain or colic, or hematuria and dysuria are annoying symptoms, nephropexy should be done. If there is no apparent kidney damage, as demonstrated by a careful urological study, nephropexy should not be done unless a well-fitting kidney corset, suitable medication and elevation of the foot of the bed will not relieve the symptoms.

Burford stresses the point of freeing the ureter of all adhesions, especially about the ureteropelvic junction. This has always been my practice and I deem it most important. Another point he mentions, when the kidney is anchored, the ureter must be straight but never taut. I am in complete accord with this.

Still another point that I wish to bring out: In cases where the ureter has undergone inflammatory elongation and even when the kidney is anchored there is still some redundancy, it is our practice to insert an indwelling ureteral catheter

on the third or fourth postoperative day and leave it in position (irrigating every 6 hours with phemerol solution 1:15,000) until the patient is out of bed on the fourteenth day.

I agree wholeheartedly with Burford that all ptosed kidneys should not be subject to nephropexy. All of us older men have seen patients go through life with floating kidneys that could be palpated well below the crest of the ileum and even pushed beyond the midline, which caused few or no symptoms. I am sure the lack of symptoms in such cases is due to the fact that the ureter does not become obstructed.

My rule in the selection of cases for operation is pain, hematuria, kidney damage, persistent infection and, of course, the age and physical condition of the patient. Other kidney surgery does not prevent the performance of nephropexy. Stones can be removed, anomalous vessels ligated and severed, plastic operations on the pelvis and reimplantation of the ureter can be done. In a recent case, I did a heminephrectomy and removed the entire duplicate ureter, then anchored the remaining portion of the kidney with a most satisfactory result.

Many cases in thin people can be successfully treated with a kidney corset and elevation of the foot of the bed. The corset must fit snugly and at the first sign of loosening should be readjusted. The patient, too, should be instructed to eat fattening foods. The corset must be worn at least a year and longer if the kidney remains ptosed.

815 Medical Arts Bldg., Memphis, Tenn.

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HERNIA OF THE KIDNEY

HERMAN L. KRETSCHMER

Lumbar hernia occurs infrequently and a lumbar hernia containing the kidney is extremely rare. Since Ciaccio's article on lumbar renal hernia appeared in 1924, the *Quarterly Cumulative Index Medicus* has not listed this condition. The standard textbooks on urology and general surgery either do not mention the condition or merely state that the kidney may be found in a lumbar hernia.

Plenck in 1774 reported a congenital hernia of the kidney. Monro in 1811 saw a case of bilateral congenital lumbar hernia with the kidneys entirely within the sac, in an infant six months old. Bayer in 1888 observed a case in which the contents of the sac consisted of the small intestine, the ascending colon and the right kidney. Ciaccio in 1924 reported a case of right congenital lumbar hernia containing kidney in a child, 18 months old.

Because of the extreme rarity of this condition, and in order to determine the experiences of other urologists, letters were sent to members of the American Urological Association. Two hundred and twenty-eight replied that they had never seen a case of hernia of the kidney. Replies were received from 12 urologists who stated that they had had a case of lumbar renal hernia under their observation. Their case histories are appended to this paper.

Lumbar hernia may occur following kidney operations when the wound closure has been faulty, when primary healing is delayed, after operations for suppurative diseases of the kidney, operations for tumor or kidney stone.

An operation upon the kidney is usually followed by severe fibrosis and adhesions. A subsequent operation upon the kidney is generally very difficult because of the fixation of the kidney to its fossa by adhesions and perirenal fibrosis.

In the case about to be reported, instead of fixation of the kidney following a previous operation for a movable kidney many years ago, the opposite condition was present, namely, great mobility of the kidney so that the kidney was easily palpable in the lumbar hernia. The operation was followed by suppuration for 13 weeks. The patient subsequently developed a hernia in which the kidney was easily palpable (fig. 1).

Because of the rarity of this condition, I wish to report the following case which was referred to me by the late Dr. D. P. Abbott:

Mrs. S. W. was first admitted to the Presbyterian Hospital September 27, 1921 for the treatment of a dislocation of the articular surface of the head of the radius. The patient stated that following the birth of a child in 1893 she had noted attacks of "bladder trouble." In November 1902, while visiting in Chicago, she stooped to lift a suitcase and felt a sudden severe pain in the right lower quadrant. Following the attack of pain, the patient developed frequent and painful urination. The urine was scanty and contained pus and blood. A cystoscopic examination at that time revealed marked cystitis. A right nephropexy was performed at the Baptist Hospital in Chicago on December 12, 1902. "*Drainage tubes were left in the wound for 13 weeks. She ran a long febrile course following the operation.*"

Examination on September 27, 1921 revealed a right lumbar hernia, which she stated has been present since her nephropexy. The kidney was easily palpable in the hernial swelling and was very tender upon very careful palpation.

The second admission was November 17, 1921 for the removal of the head of the radius.

Between her second admission on November 17, 1921 and December 2, 1935, she had 21 admissions for the treatment of the following conditions: spastic colitis, ethmoiditis, psychasthenia, arteriosclerosis, conjunctivitis, pernicious anemia, bronchitis, lumbar hernia, and an operation for an acute gangrenous appendix.

The twenty-third admission was December 2, 1935. Two months prior to this admission she was awakened out of a sound sleep by pain over the bladder with an urgent desire to urinate. She had frequency, associated burning, and pain at the end of micturition.

FIG. 1. Lumbar hernia. Kidney palpable under skin. Palpation painful.

During the past summer she reached up high to catch a curtain pole dropped by her sister hanging curtains. A severe pain lasting 3 days developed in the right kidney region. The pain was relieved by lying on the right side.

On another occasion she reached high up to a shelf in the pantry; this precipitated another severe attack of pain in right kidney region with soreness in the area for a couple of days.

She stated that when she stooped to pick up something from the floor she would have pain in right kidney region.

Physical examination revealed a right lumbar hernia, which she stated had been present since the nephropexy in 1921. The kidney was easily palpable in the hernial swelling and was very tender and painful on very careful palpation.

Repeated examinations of the urine showed blood, pus and albumin.

Cystoscopic examination on December 3, 1935 revealed a generalized trabeculation. The left pyelogram was normal. The right pyelogram revealed the kidney pelvis opposite the third lumbar vertebra lying in the "lateral" portion of the abdomen. The ureter ran transversely mesially, then turned downward. Calyces appeared rather broad; otherwise renal pelvis was normal.

Diagnosis: Postoperative lumbar hernia which contains the right kidney (postoperative nephropexy scar).

The twenty-fourth admission was January 22, 1936. The patient complained of many attacks of very severe pain in the right kidney region with considerable distress in this region especially during diarrheal attacks. She was greatly incapacitated following these attacks.

Because of the increasing frequency and severity of her attacks of pain in the kidney, recurring attacks of hematuria, the failure of mechanical supports, and the increasing inability to carry out her usual duties, she was advised to be operated upon.

Operation (February 1, 1936): Because of the marked relaxation of the abdominal wall, the age of the patient (68), the failure of a previous nephropexy, and after due consultation with Drs. D. P. Abbott and William Kirby, it was decided to do a nephrectomy. The old scar was excised. There was a marked bulging of the abdominal wall at the site of her previous nephropexy.

Pathological report: The cortex was normal. The walls of the calyces and pelvis were very thin and showed numerous areas of intramural hemorrhage. Microscopic examination showed several cysts; glomeruli were atrophic and a few were sclerotic. The cellular markings and nuclei of many of the collecting tubules were lost. In several places below the capsule there were areas of round cell infiltration.

Postoperative record: The patient made a smooth and uneventful convalescence. She stayed in the hospital 54 days after the operation for the treatment of colitis, pernicious anemia, sinusitis, and arthritis.

There were 18 subsequent admissions for the treatment of arteriosclerosis, senile dementia, coronary artery disease, chronic pyelitis, spastic colitis, and accidental injuries incurred in falls, and the presence of her lumbar hernia.

She has had no more attacks of pain in the renal area.

The patient died September 1949, of arteriosclerotic heart disease at the age of 81.

In response to letters sent to members of the American Urological Association the following replies were received:

Dr. C. D. Brunkow (Newark, N. J.) had the following experience: Female, 51. Ten years previously she had had two operations for kidney stone performed by another doctor. On physical examination Dr. Brunkow was able to palpate the kidney in the lumbar hernia. He was able to disembed the kidney from the hernia. On coughing, or straining in the erect position, one could feel the kidney slip back into the hernia. Diagnosis was verified by pyelography. She died following an operation for fibroid tumor of the uterus.

Dr. George F. Cahill (New York, N. Y.) replied: "Several years ago we had a patient who had a hernia in the wound and the kidney in the hernia as shown by both intravenous and retrograde pyelograms. He refused to have it corrected, so nothing was done about it."

Dr. Earl E. Ewert (Boston, Mass.) stated as follows: "There is, over at Cook County Hospital, the record of a herniation of the kidney through Petit's triangle; this was a congenital hernia, when I was on Ward 23 in 1927 or 1928. The patient could pop the kidney out through Petit's triangle by lateral flexion and extension of the body and the kidney could be palpated and the vessels felt

underneath the skin. Like a lot of other people, I neglected to report this case of a congenital hernia of the kidney through Petit's triangle, and I don't suppose I will ever see another one such as this."

Dr. George M. Fister (Ogden, Utah) mentioned the following case: "I have seen only one patient, in connection with Dr. Dumke, of a female, 45 years of age, with a right lumbar hernia following a kidney operation, in which the hernia apparently contained the kidney. We were definitely able to palpate the kidney in the hernial sac. I have not been able to follow it up."

Dr. Albert E. Goldstein (Baltimore, Md.) had a unique experience. He stated: "Peculiarly enough, two days ago I experienced the first one. Furthermore, it is a bilateral type of hernia of the kidneys. The story is as follows: My procedure for polycystic kidneys had been performed on this individual about eight and four months ago. One side was done by me and the other by a resident. The idea of the procedure is to deliver the polycystic kidney, aspirate as many cysts as possible and then split the kidney lengthwise. The halves of the split kidney are then sutured to the skin hoping to keep them there so that further aspiration can be made. The kidney then remains attached to the skin and always is slightly bulging. In this particular case the right kidney has not remained attached to the skin but kept on protruding out into the lumbar area. This kidney can be pushed back into the renal fossa and held in place by manipulation. The right kidney has herniated the same as the left but not quite as extensive."

Dr Leon Herman (Philadelphia, Pa.) had an extremely unusual type of renal hernia. He wrote that he had seen one patient with a lumbar hernia in which the entire kidney, occupying the sac, could be palpated outside the normal line of the body. Strangely enough this followed an accident in which the patient had been gored by a bull in childhood. The hernia was easily reducible and was held by a bandage so that he did not think operation was necessary.

Dr. Leon Howard (Denver, Colo.) wrote as follows: "I remember distinctly a few years ago having to go and take a kidney out that the patient said another doctor had operated on, and made an incision through the skin and cut the kidney half in two before I got to the muscle. Apparently, there wasn't any hernia, though, it was just a kidney from the looks of it, which had been sewn into the muscle incision as a fixation operation. That is the nearest I could say that I had come to ever seeing a hernia with a kidney in it."

Dr. H. A. R. Kreutzmann (San Francisco, Calif.) reported the following: "The patient, a doctor of medicine, was operated upon by Dr. Kocher of Bern many years ago for a third degree ptosis of the right kidney. Dr. Kocher's technique was to place the kidney in position, leave the wound open, protect it with tampons and thus permit scar tissue to form around the kidney, thereby holding it in place.

"When I examined the doctor in 1943, I could feel a distinct mass bulging from the upper half of the right loin incision. Palpation of the mass revealed a perfectly normal kidney which appeared to be subcutaneous. When this mass was pushed, it shot into the retroperitoneal space and remained there only as long as pressure was kept on the scar. The doctor wears a belt around his middle

to keep the kidney in place. Urological examination at that time showed no abnormality of this kidney. The doctor is still living today and is hale and hearty at the age of 82. He still has his kidney."

Dr. P. E. McCown (Indianapolis, Ind.) wrote: "In reply I believe I may say that we have such a case as you specify. This is a patient who has had perinephric abscesses on both sides and has large hydronephrotic sacs in both kidneys with very difficult drainage. In an attempt to repair one side we found the adhesions so great it was impossible to do a proper repair operation, therefore we have installed nephrostomy tubes in both kidneys with which he has been living for about two years. Following this he gained between 40 and 50 pounds in weight and the right wound herniated and contains the kidney."

Dr. Lazarus A. Orkin (New York, N. Y.) answered the inquiry as follows: "I quite agree with you that the ordinary lumbar hernia does not as a general rule contain a kidney. However, about 2 years ago, we had a case on our service at Montefiore Hospital for Chronic Diseases in New York which had had a right nephropexy for a nephroptotic kidney at another hospital some 3–4 years before she came to Montefiore. At the time we saw her, she complained of excruciating pain in the right loin. Examination revealed a large right lumbar hernia and that the kidney was subcutaneous. It is quite interesting that every time she had an attack of severe right loin pain simulating the so-called Dietl's crisis, the kidney could easily be felt displaced subcutaneously. The pain was relieved by having her go to bed and gently manipulating the kidney back to position. The kidney itself was quite hydronephrotic and excretory pyelograms showed a marked angulated and tortuous ureteral pelvic junction.

"Because of the fact that she had this marked pain and because she was well on in years, a right nephrectomy was performed and at the time of operation, the pedicle was about 3–3½ in. long. The kidney was found to be subcutaneous. Following the nephrectomy, repair of the lumbar hernia was easily performed.

"This is the only case that I have seen similar to the one that you described."

Dr. R. Pearse (Toronto, Canada) reports the following case: "The patient, a male, had a right pyelolithotomy for stone (elsewhere) followed by a lumbar hernia. Attempted repair was made."

Cystoscopy and pyelography by Dr. Pearse when he first saw the patient showed the colon next to the skin and in the hernial sac, marked lateral displacement of the kidney with hydronephrosis.

At operation the colon and kidney were found just under the skin with a thin layer of fascia covering them. There was obstruction to the pelvis by adhesions. They were removed. The hernia was repaired. The kidney was not removed.

Two weeks after discharge he developed some perirenal urinary extravasation due to obstruction of his ureter and a nephrectomy was done. It was then impossible to repair the hernia."

Dr. Ralph E. Powell (Montreal, Canada) writes: "I have been unfortunate in having two postoperative hernias following nephrectomy. One had a definite mass resembling kidney. Patient refused to have a repair and is deceased."

SUMMARY

A case of true lumbar renal hernia is reported. A careful review of the literature reveals this condition to be very rare. In 11 of the 13 cases reported in this paper, the patients had had a previous kidney operation. In the remaining 2 cases, one was apparently a true congenital renal hernia through Petit's triangle and the other case was the aftermath of goring by a bull.

122 S. Michigan Ave., Chicago 3, Ill.

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DISCUSSION

DR. T. LEON HOWARD (Denver, Colo.): From The Associated Press a few weeks ago an article by a urologist appeared giving the results of reported cures by nephropexy of many of the body ills; such as certain forms of insanity, Addison's disease and both hypotension and hypertension.

Many years ago the indiscriminate fixation of a kidney resulted in disrepute of the operation and in the 1920's Bill Braasch became so prejudiced against this type of surgery he practically refused to countenance such an operation.

There is, unquestionably, a definite place for this type of surgery under certain conditions and Dr. Livermore may have brought the causes out; if so, I will add my reasons to his.

Certainly, we shouldn't allow our judgment to be influenced by the mass surgery of one urologist, for statistics have shown that in the female 22.8 per cent compared to 2.1 per cent in the male have ptosis of the kidney and that the right kidney is more liable to be abnormally movable 15 to 20 times more than the left. Consequently, with this anatomical defect staring us in the face many patients will of necessity develop symptoms that are referable to this important organ.

Dr. Edgar Burns asked me last night what was my criterion for nephropexy and I was very emphatic in stating that just because a ptosed kidney was found it should of necessity be surgically fixed. But, if a patient who had already had three surgical scars on her belly without relief of symptoms and a ptosed kidney was found and proved by symptoms, history, and pyelograms as well as physical examination, to be loose; even though there was no kidney destruction from poor drainage, a nephropexy should be done.

These patients with ptosis are usually of the 3L type; namely, long, lean and lanky as distinguished from the fat, fair and forty gallbaldder type. But, fat people can and do have ptosed kidneys for they were not always fat and as we are upright 16 hours in the 24, while becoming fat, the kidney is ptosed and become fixed in its malposition with resulting symptoms later on in life.

These patients all have varying degrees of ileus, constipation, and indigestion and it is these predominant symptoms that lead to the multiplicity of surgical scars as these patients have a visceroptosis to confuse the issue. Ileus with any renal disease is an outstanding finding but the internist and general surgeon apparently have never discovered this. When finally the patient is sent to the urologist as a last resort and a correct diagnosis and surgical repair are made, you are rewarded by the thanks of a grateful patient.

DR. C. E. BURFORD (St. Louis, Mo.): I would be remiss in courtesy if I did not discuss Dr. Livermore's paper after he has repeatedly quoted me.

I still do nephropexies but am more careful in the selection of cases than formerly. When we are sure that the symptoms complained of are due to the low position of the kidney, we are sure of a good result.

There are a number of cases suffering from the effects of nephroptosis that

can be relieved by bed rest, forced feeding and accumulation of some abdominal fat, but it requires a longer hospital stay than does nephropexy.

Of course we do plastic surgery on the pelvis and ureteropelvic juncture in many of these cases. To avoid rotation of the kidney, we now place it in its new bed up under the ribs before placing the fixation sutures in the capsule thereby insuring the most natural position.

Nephropexy will always be a proper procedure for nephroptosis causing pain and kidney damage.

Dr. William P. Herbst (Washington, D. C.): I want to make just one comment. In every patient on whom I have operated in the last 7 or 8 years for ptosis, anatomically the kidney has been one which had the pelvis coming out of the posterior surface of the parenchyma of the kidney. I am sure that the position of the pelvis of the kidney has something to do with symptom-producing in many of those cases.

Dr. John K. Ormond (Detroit, Mich.): In connection with nephropexy, we have concluded that a routine plastic on the pelvis should be done in every case.

Dr. David M. Davis (Philadelphia, Pa.): I would like to support Dr. Ormond's contention, particularly mentioning the fact that it has been my experience that it is impossible to tell by looking at the exterior of the pelvis and ureter whether any narrowing or obstruction exists. Therefore, since it is so important to do everything that needs to be done to a kidney at the time of nephropexy, in order to avoid the necessity for a second operation on kidneys that have been fixed (because they are difficult for the surgeon and hazardous for the patient), one should never omit to open the pelvis and calibrate the ureter carefully and make sure that it is entirely adequate before fixing the kidney.

Dr. George Livermore (Closing): I believe there is nothing further to add, Mr. President, except to thank the gentlemen for their discussion.

Dr. Herman L. Kretschmer (Closing): My experience coincides with that of Dr. Howard and several of the previous speakers. I find that so many of the patients who are referred for nephropexy have other concomitant lesions that impress me as being much more important than the movable kidney itself.

I have set up for myself very rigid conditions that are to be met before I perform a nephropexy. This, therefore, reduces very materially the number of cases upon which I feel justified in doing a nephropexy. I don't suppose that I have performed this operation as such more than 10 or 12 times.

The point has been stressed that great care must be exercised in replacing the kidney. I subscribe to this statement. The importance for the necessity of extreme care in replacing the kidney may be illustrated by this case: Several years ago I saw an adult female patient who had had a nephropexy performed by a very competent surgeon. Following the operation she still had the same old pain—in other words, the operation did not relieve her complaints. I made a retrograde pyelogram. This showed that the kidney had been replaced upside down. I operated upon the young lady, isolated the kidney, freed it from some adhesions, and replaced it in its proper position. This was followed by complete relief of pain.

PRIMARY CARCINOMA OF THE URETER

JOHN A. TAYLOR

Primary carcinoma of the ureter, which is being reported with increasing frequency, still is an interesting and rare condition. Long, in a review of the literature in 1949, found 201 cases and added one more.[1] Since then Brooks has reported 3 cases.[2] Two cases are being reported here.

OCCURRENCE

According to Anderson, they make up 1 per cent of the tumors of the upper urinary tract. They occur in the lower third of the ureter in 75 per cent of the cases.[3] They have a tendency to be multiple.

PATHOLOGY

Melicow added considerably to our knowledge of these tumors and their behavior when he called attention to the fact that, embryologically and histologically, the linings of the pelvis, ureter, and bladder are similar.[4] Because the mucosa was impervious to urine, he called it urothelium to distinguish between the skin and lining of the gastro-intestinal tract. Neoplasms from any point along this urothelium have similar gross and microscopic pictures. Structurally, they may be papillary, sessile, or polypoid—the papillary group composing 75 per cent of the total, and about 60 per cent of this group are malignant. There is a definite tendency for multiplicity along the urothelium,[5] and this may have been erroneously called tendency to recur. This multiplicity was first thought to be an implantation by surface extension, but this seems to have been disproved. The second theory was extension by lymphatic spread. Histologically, the lymphatics are especially numerous in the stroma of the ureter, which corresponds to the submucosa. This would lead one to believe that a lymphatic spread would be plausible,[6] but according to Sakata the lymphatics of the ureter fall into three groups: 1) an upper group, which joins the renal lymphatics;[7] 2) a middle group which drains into the interiliac nodes; and 3) a lower group, which anastomose with the lymphatics of the bladder. This division of lymphatics would disprove such a theory, and one would expect to see more growths in the lower ureter secondary to bladder tumors. A lymphatic spread could well explain the case of Ferris, in which growths in the lowermost portion of both ureters appeared secondary to a bladder tumor.[8] Vesical tumors, however, rarely are accompanied by tumors in the upper urinary tract. Thirdly, there is a

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[3] Anderson, W.A.D.: Pathology. St. Louis: C. V. Mosby, 1948.
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[5] Bailey, M. K., Fort, C. A. and Harlin, H. C.: J. Urol., **62:** 44, 1949.
[6] Smith, E. P. and Copenhaver, W. M.: Bailey's Textbook of Histology. Baltimore: Williams and Wilkins, 1948, 12th ed.
[7] Morris: Human Anatomy. Philadelphia: Blakiston. 1942.
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multicentric origin described by Ewing which postulates that different parts of the urothelium have the same carcinogenetic properties.[9] The primary carcinomas of the ureter are often associated with calculi. They metastasize early and more extensively than carcinoma of the bladder, and may involve the regional nodes, liver, vertebrae, lung, kidney, spleen, brain, pancreas, skin, pericardium, and prostate.[3]

ETIOLOGY

The most interesting aspect of carcinoma of the ureter is its etiology or pathogenesis. Much has been written on this subject both from the experimental and clinical viewpoint. Cullough and Doldorf, according to Fagerstrom, were able to produce metaplasia in animals with a diet deficient in vitamin A and with overdoses of sex hormones.[10] This metaplasia was nullified by feeding vitamin A. Bothe made serial sections of 6 ureters removed for carcinoma, both adjacent to the growth and in the distal portions.[11] From his pathologic studies, he concluded that papillary carcinoma of the ureter was caused by excretory irritants or more probably carcinogenic agents which reached the ureter through the blood or lymph. He also deducted that implantation was not the cause of all the lesions. Anderson believes that it is "doubtful if leukoplakia ever developed into malignant neoplasm of the ureter".[3]

Fagerstrom proved that there was no basis for the cell nest theory of Von Brunn,[9] and believed that the etiology was carcinogenic. Gualteri, in a discussion of the pathogenesis of these tumors,[12] believes that they were initiated with carcinogens and perpetrated by tissue enzymes. Hughes showed that homologous transplants of bladder mucosa in direct contact with the carcinogen-20-methyl cholanthrene, which is the most active carcinogen today, produced epithelial tumors.[13] This carcinogenic agent is found in the sex hormones, which in turn are all derived from cholesterol, and in folic acid. This carcinogenic theory seems to be the most plausible one, and if urine-borne, explains the reported disappearance of bladder carcinoma following diversion of the urinary stream, but does not explain why tumors continue to appear in the ureter following nephrectomy for papillary carcinoma of the pelvis. If this carcinogenic agent is brought to the urothelium through the blood or lymph, it is surprising that one does not find tumors in the opposite ureter as well as on the same side as the initial lesion.

SYMPTOMS

The symptoms of primary carcinoma of the ureter are hematuria in about 75 per cent of the cases, protruding tumor in about 25 per cent of the cases, and the rest of the symptoms are due to ureteral obstruction.[14]

[9] Ewing, J.: Neoplastic Diseases. Philadelphia: W. B. Saunders Co.
[10] Fagerstrom, D. P.: J. Urol., **59:** 333, 1948.
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[12] Gualteri, T., Hayes, J. J. and Segal, A. D.: J. Urol., **59:** 1083, 1948.
[13] Hughes, B.: J. Urol., **62:** 833, 1949.
[14] Harrison, F. G., Warres, H. L. and Fust, J. A.: Ann. Surg., **130:** 902, 1949.

CASE REPORTS

Case 1. W. L. G., a 60-year-old white man, was first seen on July 8, 1947, complaining of pain in his left side, with hematuria. Cystoscopic examination revealed an obstruction in the lower left ureter which was proved to be a ureteral calculus. Excretary urograms showed distention of the ureter and kidney on that side behind the obstruction. A small calculus was passed after a ureteral meatotomy.

Two months later a follow-up cystoscopic examination showed no obstruction, and a left pyelogram showed a return of the kidney to normal size and architecture. A good ureterogram was not obtained at this time. See figure 1.

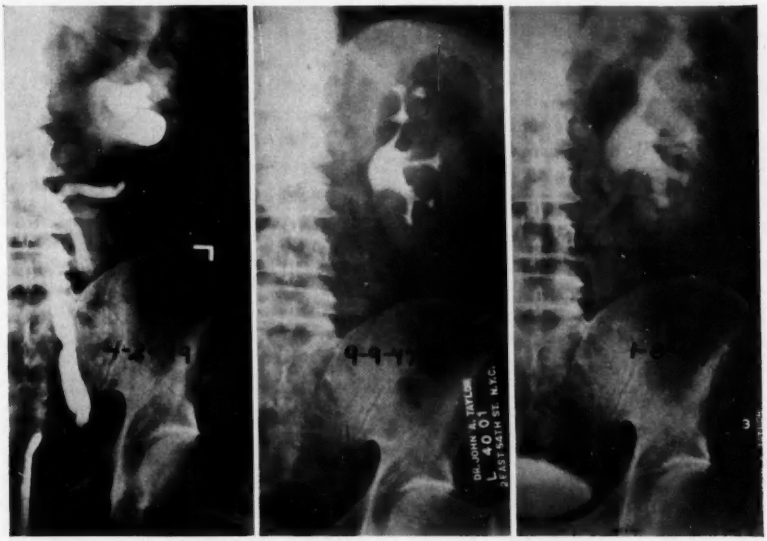

FIG. 1

On March 22, 1949, the patient complained of painless hematuria of 5 days' duration. Cystoscopic examination showed a small papillomatous growth projecting from the left ureteral orifice. He was admitted to St. Luke's Hospital on April 1, 1949, for a biopsy and preoperative workup. A small piece of the papillomatous growth was biopsied, and the biopsy showed "only a mass of hyalinized connective tissue with a few small blood vessels and a few muscle cells. No malignant cells are seen. The small size of the biopsy specimen makes diagnosis unsatisfactory."

Both ureters were catheterized, and phenolsulfonphthalein was obtained from the right kidney after intravenous injection in 3 minutes, and was markedly delayed on the left. X-ray studies showed a normal right urinary tract, with left hydro-ureter and hydronephrosis, with a filling defect in the lowermost portion of the left ureter. Urine was obtained for cytologic study, and was sent to Dr.

Papanicolau. It was reported: "Urine specimen of April 5, 1949, fairly good evidence of malignant neoplasm, class 4."

General physical examination was essentially negative, with a blood pressure of 164/78. The only abnormal findings were a left oblique inguinal hernia and an enlarged left kidney. X-ray of the chest showed no evidence of metastasis. Urea nitrogen was 13.5, sugar 102, and CO_2 54.1. An electrocardiogram showed normal rhythm.

On April 20, 1949, a left nephro-ureterectomy was done, the kidney and upper part of the ureter being removed first through a lumbar incision, and the lower ureter through a left paramedian incision. In removing the lower part of the ureter, which was very edematous and friable, it was accidentally torn. In order to insure complete removal of the growth, which was in the lowermost portion of the ureter, the bladder was opened, and the incision was carried down to and around the left ureteral orifice, which had a catheter in situ. After a good cuff of the bladder was resected, it was clamped off and the lowermost portion of the ureter was freed through the bladder. The resection of the ureter was then completed from above. The incision in the bladder was closed around a Pezzar catheter. The patient received 500 cc blood and returned to his room in good condition, and had an uneventful convalescence.

The pathological report (Dr. B. Earl Clarke) was as follows:

"Gross description: Specimen consists of the left kidney weighing 107 gm. and measuring 11 by 5.5 by 3 cm.... The calyces extend to within 5 mm. of the surface and in no renal pyramids are recognizable. The renal pelvis is lined by smooth, shiny, opaque mucosa and the wall is thin....

"Received separately are two segments of ureter. At the lower end of the longer segment there arises from the mucosa a firm, papillary and nodular tumor, 1.8 cm. in diameter. In this area the external surface of the ureter is smooth and its wall is soft. For a distance of 1.5 cm. above the tumor the mucosa is opaque, indurated and raised 1 mm. in height. The remaining portions have a soft wall and a smooth. shiny, opaque mucosa.

"Microscopic description (fig. 2): Sections of the kidney reveal considerable interstitial fibrosis and infiltration by lymphocytes and plasma cells....

"A portion of renal pelvis is seen lined by intact, normal appearing transitional epithelium.

"The section of ureter in the region of the tumor shows a superficial tumor composed of orderly arranged, solid groups of spindle and cuboidal cells. closely packed and quite uniform in size and shape. Mitotic figures are rare. The tumor is grossly papillary in some areas but in most areas consists of solid groups of tumor separated by thin strands of connective tissue.

"The base shows the origin of the tumor from normal appearing transitional epithelium and the tumor shows no microscopic evidence of invasion of the muscular coats of the ureter.

"Diagnosis: Carcinoma of the left ureter (transitional cell type); left hydronephrosis, chronic pyelonephritis."

Case 2. T. D., a 74-year-old woman, was first seen on June 1, 1949. She gave

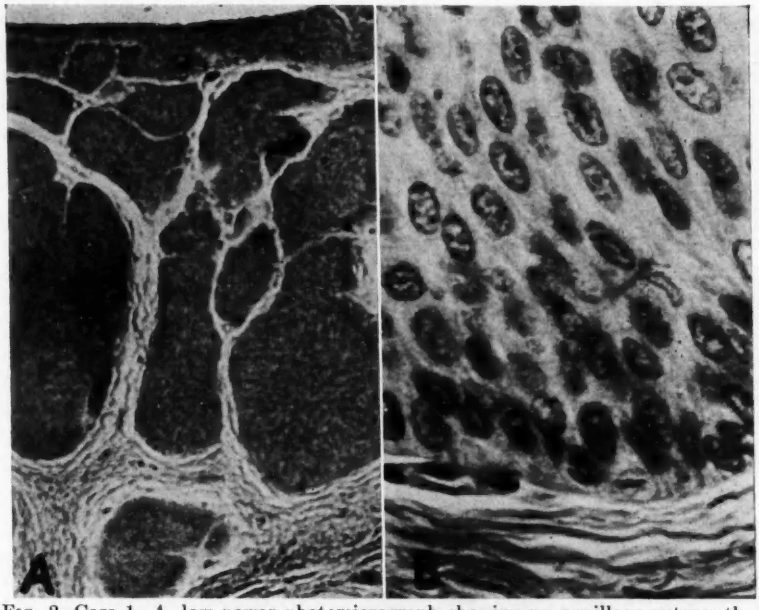

FIG. 2. Case 1. *A*, low power photomicrograph showing no papillary outgrowth, but broad cords of well differentiated epithelial cells infiltrating submucosa and muscle. *B*, high power showing regular size and shape of well differentiated transitional type of epithelial cells.

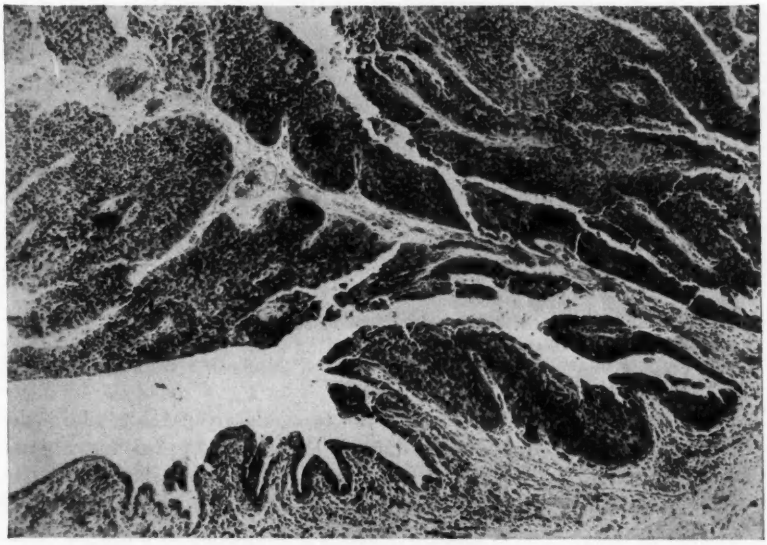

FIG. 3. Case 2. Low power photomicrograph showing normal epithelium at lower left and papillary outgrowth of tumor.

a history of hematuria and vaginal bleeding, for which a vaginal polyp had been removed 8 months before. Since then the hematuria had been intermittent. Cystoscopic examination in the office was unsatisfactory because of bleeding from the right ureter, and she was admitted to St. Luke's Hospital the following day.

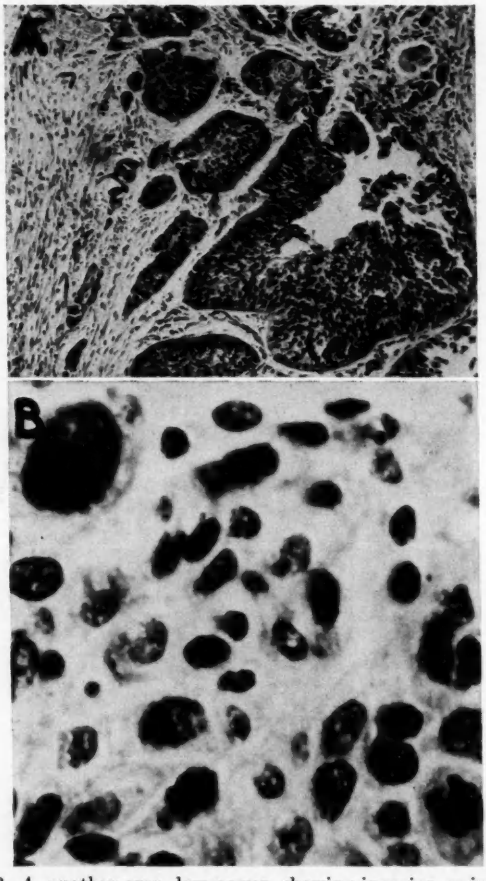

FIG. 4. Case 2. *A*, another area, low power, showing invasion or infiltration of muscle wall. Variation in size and shape of cells is evident. *B*, high power showing variation in size and shape of epithelial cells and mitotic figures.

General physical examination showed an obese, elderly woman, who looked anemic. She had a systolic apical murmur, with an accentuated aortic sound. Blood pressure was 180/100. On the basis of history and physical examination, a provisional diagnosis of carcinoma of the upper urinary tract and hypertensive cardiovascular disease was made. Her blood count on June 3, 1949 showed 9 gm. hemoglobin, 62 per cent and 2,900,000 red blood cells. After three transfu-

sions of 500 cc blood, she had 12.5 gm. hemoglobin, 86 per cent, and 4,400,000 red blood cells. The blood chemistry was normal. The report on the x-ray of the chest read: "No pulmonary pathology noted."

On repeat cystoscopic examination, there was a clot protruding from the right ureteral orifice, and after this was removed, a papillary growth was seen filling the orifice. The left ureter was catheterized. The urine from the left kidney was normal, and phenolsulfonphthalein intravenously appeared in 3 minutes in good concentration from that side. A left ureteropyelogram was within normal limits.

On June 11, 1949, the kidney was removed through a curved iliolumbar incision, and the lower ureter was removed through a midline suprapubic incision. Because of the low position of the tumor, the bladder was opened, and incised down to and around the right ureteral orifice. A cuff of vesical mucosa 3 cm. in diameter was left attached to the ureter, and then was used to cover the end of the ureter. After the lower end of the ureter was freed from the bladder wall, the resection was carried out from above retroperitoneally.

The pathological report (Dr. B. Earl Clarke) was as follows:

"Specimen consists of two portions:

"A, wrapped separately and labelled right ureter. The external surface is dull, opaque, and has numerous attached fibrous shreds. Over 11 cm. of length at one end, the ureter is firm and irregular with yellow fatty deposits on its surface.

"On opening the lumen the ureter is dilated with smooth, gray mucosa for a distance of 7 cm. At this point there is a gray, soft, sessile mass arising from the mucosa and measuring 2 by 1.3 cm. to a height of 8 mm. Similar growths are seen in the shorter of the two pieces of ureter.

"B, right kidney weighing 75 gm. with attached peri- and nephritic fat. It measures 9 by 5 by 2 cm. . . . .No cortex or pyramids are recognizable. . . .

"Microscopic description (figs. 3 and 4): Sections of ureter through the tumor masses reveal an area of transitional epithelium infiltrated by lymphocytes, plasma cells, eosinophiles, and fibroblasts. This gives way to a papillary, then sessile projecting mass of transitional epithelium composed of irregular strands, cords and sheets of large polygonal cells showing many mitotic figures. These cells invade the musculature of the ureter and in a few areas appear to have reached the serosa. A similar process is seen in the mass sectioned through the distal end of the ureter and bladder wall. However, the bladder epithelium does not appear to be involved beyond the mass except by lymphocytes and plasma cells invading the submucosa and muscularis.

"Sections of the kidney reveal hyalinized thickening and obliteration of the most peripheral vessels and glomeruli as well as diffused, generalized infiltration of the kidney parenchyma by lymphocytes, plasma cells, eosinophiles, and fibroblasts. Many of the tubules are obliterated while others show dilatation and flattened epithelium. The glomeruli show fibrous thickening and infiltration by mononuclear leukocytes. The calyces show extensive areas of granulation tissue.

"Diagnosis: Carcinoma of right ureter (transitional cell); chronic pyelonephritis, right; hydronephrosis, right."

In both of these cases, in order to insure adequate resection of the lowermost

portion of the ureter, a cystotomy was done and a good cuff of mucosa was excised transvesically. Bovie and Bors had previously used this method.[15]

SUMMARY

Two cases of primary carcinoma of the ureter are reported, one single and the other with multiple growths.

Cystotomy was done in both cases to insure adequate resection of a cuff of vesical mucosa.

2 E. 54th St., New York, N. Y.

[15] Bovie, C. F. and Bors, E.: J. Urol., **54**: 434, 1945.

PRESENT CONCEPTS AND FUTURE PROSPECTS OF PRECISION UROLOGY

JOSEPH FRANCIS McCARTHY

In the short time allotted, it will be possible to present in only the most brief form, a summary of our present concepts of progress in precision urology, as well as our recent efforts at perfecting some well established procedures.

INFANT CYSTOSCOPES

In the past, urologists frequently leaned toward synchronous bilateral ureteral catheterization with or without pyelography. To achieve this aim much had to be sacrificed: first, as to size; second, the various fixed substitutes for the usual adjustable deflector. Moreover, it seems to us that with our improved intravenous methods, synchronous bilateral pyelography is neither indicated or desirable in any but the most exceptional case. The instrument here depicted is a 10F single catheterizing instrument carrying a large No. 3 ureteral catheter and an adjustable deflector. This we are credibly informed, is the smallest infant cystoscope yet constructed. See figure 1.

FOROBLIQUE AND RETROSPECTIVE ENDOSCOPE

It was not so long ago that it became evident we were not visualizing certain conditions, such as vesical growths, in their entirety. A recent electrocoagulation of a subsessile neoplasm was thought to be completely destroyed until seen with the instrument depicted in figure 2. This telescope, which is provided with an adjustable mirror for retrograde as well as foroblique vision, revealed the growth as incompletely destroyed. An added reason for this modification is its especial adaptability for the management of growths on the superior aspect of the bladder in proximity to the internal sphincter. This seems to us a much needed addition to our armamentarium.

THE MODIFIED PANENDOSCOPE

For many years this instrument (fig. 3) with its unique system of vision has enjoyed a wide vogue. I have never been completely satisfied with it, first, because for adequate visualization of the entire bladder, it was necessary to begin inspection at the onset of the inflow, and while filling the organ. Then with the visual end of the telescope at the internal sphincter to maintain vision in the act of emptying the bladder, only thus can one achieve its full usefulness. While these steps should still be carried out, the instrument as described in the previous paragraph answers all requirements. For years there has been another need, the incorporation of an adequate deflecting apparatus. In the instrument here shown this has been accomplished.

Here then, until the advent of applied electronics and the micro-wave, is the answer to our endoscopic problems; single or double, large or small, ureteral catheters, satisfying deflection, metallic boules, etc., plus magnificent vision. At all events, this effort has met with the enthusiastic approval of my brilliant but hard-boiled departmental associates, which is all any chief can reasonably ask.

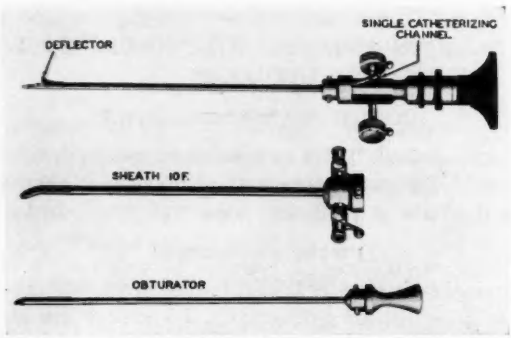

FIG. 1. McCarthy infant cystoscope with telescope, single catheterizing channel and deflector. Sheath is 10F and an obturator is provided.

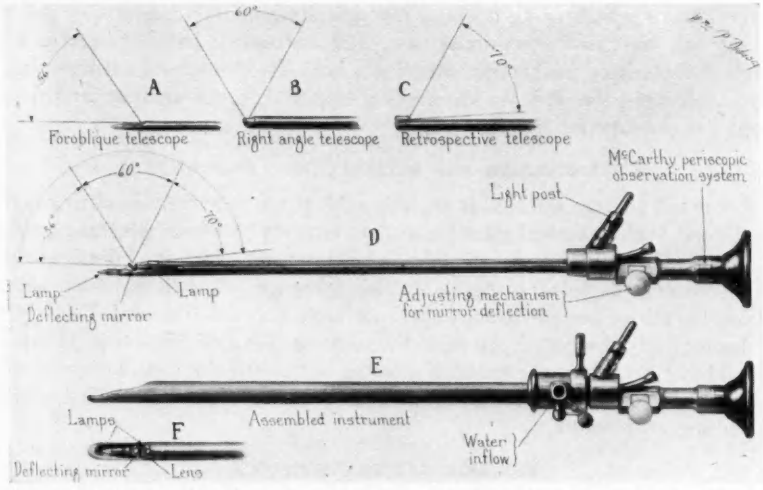

FIG. 2. McCarthy foroblique retrospective panendoscope. Illustration demonstrates visual field and component parts of instrument.

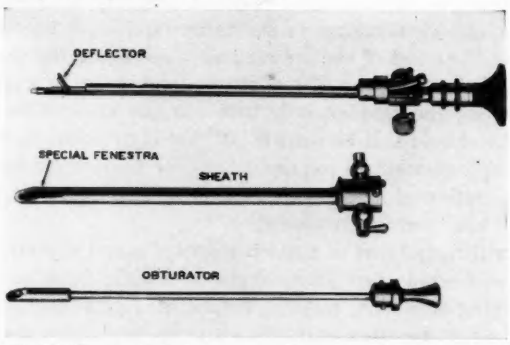

FIG. 3. McCarthy deflecting panendoscope with component parts

VISUALIZED ELECTROTOME

This too, has been the instrument that served a purpose for which it was not designed. It has brought to the doors of many of our colleagues more folding money than they had ever anticipated. It too, was susceptible of improvement. Electronic or remote control provides a green and a red button, incorporated in the instrument, which obviates the need for the awkward footswitch, shortens operating time, minimizes bleeding, with their co-incidental advantages. Another defect is the more than occasional postoperative incontinence. To obviate this serious defect, it seemed that an especially designed sheath so constructed as to engage the supra montaine prostate, push it away from the external sphincter and then excise it might provide the answer. It did seem so in actual practice, but the current not only removed the prostate, but also disintegrated the acuminate terminal in the floor of the sheath. This defect has been correct with a terminal that is resistant to the high velocity current. Another application for this special sheath is the fixation of vesical growths prior to excision—this while not always necessary is at times desirable. It is merely presented for your consideration as it has not yet been accorded the acid test of time. Other advances with this instrument have been technical and clinical.

Believe it or not, we show here a 12F resectoscope (fig. 4) which though in the same situation as the last mentioned development, seems to be something more than a toy, and it may fill an occasional void. As a matter of fact, one of my associates, Dr. Kramer, brought a 12 year old boy with complete retention due to a middle lobe prostate obstruction. Through a perineal incision and a 16F resectoscope, he was able to perform a satisfactory resection on this patient.

Now for the clinical side. Some several years ago, we developed, in our department, a method of arrestation of bleeding following suprapubic prostatectomy. The patient was placed in the cystoscopic position which, incidentally, is much better for enucleation than the dorsal. He was prepared above and below, the prostate enucleated intra-urethrally the cavity packed with very hot gauze. After these steps, a visualized electrotome was passed per urethram and the arteriolar bleeders electrocoagulated under perfect vision, and the operation was completed without packing or traction bag. This seemed to me a rational as well as the first precision method of conducting such operation. Only a few were carried out in this manner as I could not sell the idea to my chief departmental associate, though the objection advanced seemed to me insufficiently weighty—"that injury to the prostatic urethra might occur in the passage through the weakened canal." It then remained dormant until Dr. A. Hyman of our city, a urological surgeon of wide experience, took up the procedure. He recently reported some thirty odd cases carried out by this method with complete closure; one mortality, a coronary. The shortest healing time was 7 days and the average 12. I am not, however, an advocate of complete closure following suprapubic prostatectomy. For the benefit of some ill informed commentators who have been a bit strabismic in their recognition, and for the purpose of the record, all the foregoing with the exception of the application of remote control, has directly resulted from our research.

Some in this audience were present when we first demonstrated the feasibility of prostatic resection with a simple hand loop through a panendoscope, provided with a neutral terminal on the sheath of that instrument.

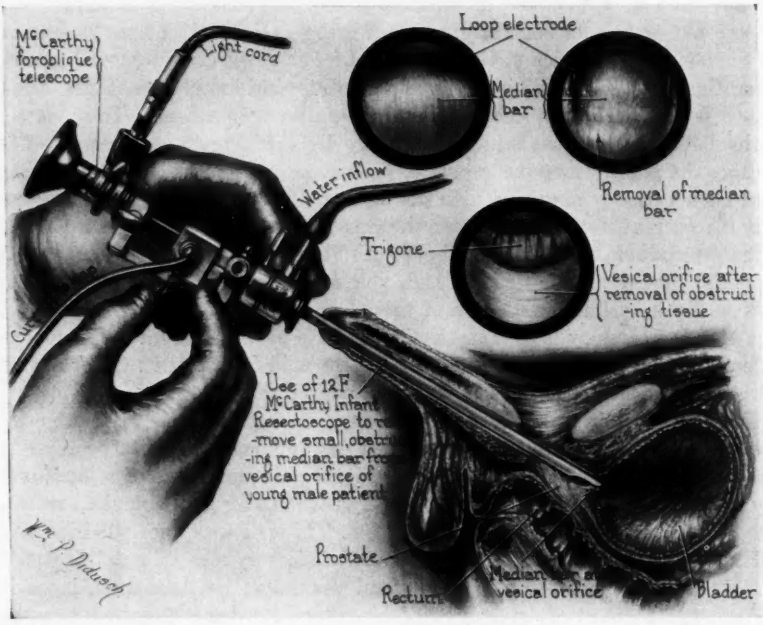
McCarthy foroblique telescope
Light cord
Loop electrode
Median bar
Water inflow
Removal of median bar
Trigone
Vesical orifice after removal of obstruct -ing tissue
Use of 12F McCarthy Infant Resectoscope to re -move small obstruc -ing median bar from vesical orifice of young male patient
Prostate
Rectum
Median bar at vesical orifice
Bladder

FIG. 4. Shows on section, removal of small, obstructing median bar with 12F McCarthy resectoscope. Inserts are views obtained during operation.

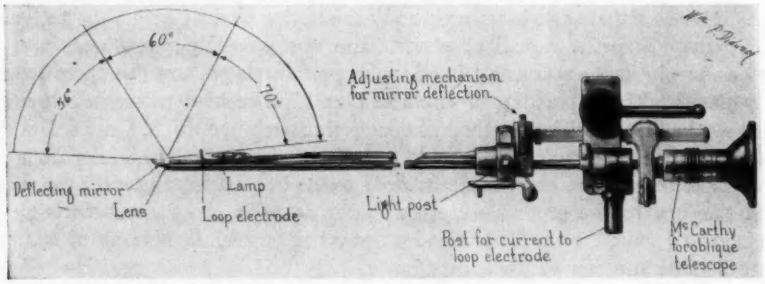

FIG. 5. McCarthy foroblique retrograde resector. Illustration demonstrates visual field and relation of loop electrode to lens and reflecting mirrors.

CATHETERIZATION OF EJACULATORY DUCTS

Probably the majority of urologists are content to permit this occasional though potential focus of infection to continue its residence in the field of conjectural obscurity. A notable few, however, have shown the perspicacity in following through. Notable among such is Dr. Robert Herbst of Chicago, whose

experience in his many cases has been enlightening. Complacency is the anethema of progress. If contented with one's self on this matter, at least give younger associates an opportunity to look into it. Years ago, we published a communication on this subject, on methods of collecting vesicular fluid for culture, by the injection of normal salt solution. Hemospermias were treated successfully by instillation of dilute solutions of silver nitrate. We even tried insemination with ejaculate (vicariously obtained) diluted the same with buffer solutions of phosphate and glucose in incubators, injected it into azospermic vesicles and recovered the same after 48 hours, actively motile. The "bug" in this experiment

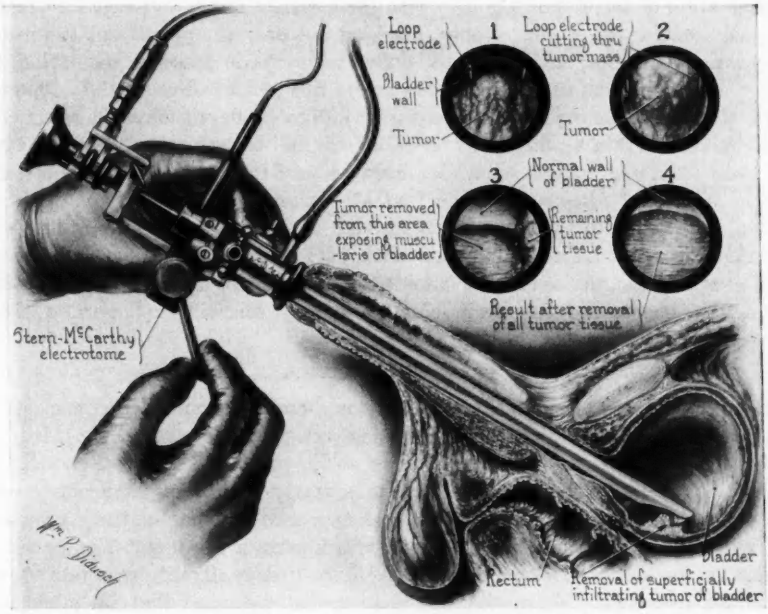

FIG. 6. Shows, on section, McCarthy resectoscope in removal of superficially infiltrating tumor of bladder. Inserts are views obtained during operation.

was the presence of blood and pus cells. All this study needs is the sterilization of the spermatozoa without their destruction. Perhaps the newer antibiotics may provide the answer.

RETROGRADE PROSTATIC RESECTION

A considerable sum of money has gone into this complex subject on the part of my collaborators. It had seemed to us we were doing a retrograde operation with foreoblique vision. Perhaps both types may provide the answer. It has not as yet received our complete approval. See figure 5.

THE UPPER URINARY TRACT

Here immediately before you is a most interesting field of precise endeavor for the elaboration of which the limits of this paper will not permit. Briefly,

they comprise the ureteral catheter bag which can serve a number of purposes, such as blocking the renal outflow of one side during excretory urography as a substitute for pyelography, for precise renal pelvic lavage for a given period of time with the newer antibiotics under manometric regulation; as a supplement to constitutional treatment of incipient renal tuberculosis; and to facilitate location or dislocation of ureteral calculi; finally, in the biochemical disintegration of large renal calculi by similar methods, through nephrostomy self-retaining tubes with a prolongation down a part of the ureter to prevent the entrance of particles of stone; the objective here being, with a precise quantitative chemical examination of the stones together with their surface characteristics, an irrigating solution for the specific stones, reaching not only the pelves but the interstices of the calyces; again perhaps, under manometric pressure regulation; finally, employing the newer catheters that do not permit of crystalline deposits (polyethylene). The objective is to conserve kidney tissue, to convert a seemingly inoperable case into a potentially operable one. All these may, we hope, receive an assist from such gadgets as a visualized ureteral forceps, a renoscope, a renal pelvic visualized forceps, and the fantastic microwaves transmitted without wires, deflected into interior organs through a magnatron sheath by an electromagnetic field, an electronoscope without lenses, the interior steps being projected on a magnetized screen outside the body. These latter complex electrophysical concepts are the brain children of my scientific collaborator, Mr. Frederick J. Wallace.

BLADDER NEOPLASMS

Here again, in certain clinics, there is an over-emphasis on endoscopic electrocoagulation, in others the same stress on uretero-intestinal anastomosis. In the latter we hear and read more about new techniques than late end results. A case of endoscopic electrocoagulation with a fatal termination from pelvic cellulites induced the writer to find a better approach to some of these growths short of total cystectomy. A case report will illustrate the point. The patient, a man in the sixties, had six discrete papillary tumors. Total cystectomy was recommended. As an alternative the opinion was expressed that we might be able to carry him along for a number of years without the more radical procedure. The latter was accepted. The bladder was completely mobilized. A laparotomy pad was placed between the bladder and rectum, the growths on the mobile portion of the bladder excised with loop electrodes with remote control buttons. The two growths on the trigone were excised down to the musculosa, the base intensively electrocoagulated. This patient after 2½ years is microscopically, endoscopically and symptomatically free of growth (papillary adenocarcinoma).

Surgical urology is pretty much the same in large centers here and abroad. Instrumental precision urology is something else. It is in this field that American urology has been blessed by a succession of technical geniuses, first, Reinhold Wappler, then Frederick Wappler, and now Frederick Wallace. It is through the collaboration of such men who were and are scientists first and business men after, that world urology has been attracted to our doors.

2 E. 54th St., New York, N. Y.

FURTHER OBSERVATIONS ON THE ELECTROLYTE PATTERN OF THE BLOOD AFTER BILATERAL URETEROSIGMOIDOSTOMY

HOWARD M. ODEL (by invitation)

Division of Medicine

DEWARD O. FERRIS (by invitation)

AND

JAMES T. PRIESTLEY

Division of Surgery, Mayo Clinic, Rochester, Minn.

At the last regular session of the Section of Urology of the American Medical Association (1949), two of us (Ferris and Odel) reported on some of our experiences with a group of cases in which abnormalities in the electrolyte pattern of the blood developed after bilateral ureterosigmoidostomy.[1] The characteristic abnormality which develops in such patients is hyperchloremic acidosis, associated with azotemia and dehydration. In a series of 141 patients who underwent bilateral ureterosigmoidostomy between the years 1939 and 1949, 79 per cent manifested some degree of hyperchloremia at some period after their operations, and 80 per cent showed laboratory evidence of acidosis of some degree as manifested by values for the carbon dioxide combining power of the plasma of less than 22 milliequivalents of bicarbonate per liter.

PRESENT STUDY

Since that time we have had the opportunity of conducting a more detailed study on one of these patients, the results of which we wish to report on at this time.

The patient, a man aged 25 years, registered at the Mayo Clinic September 11, 1948. One of us (Priestley) had performed bilateral ureterosigmoidostomy on this patient 9 years previously when he was 16 years old. He had progressed satisfactorily after this operation until 2 years before admission when he had begun to experience backache and recurrent episodes of chills and fever. In addition, he reported at that time that for several months he had had no appetite, had had frequent nausea and vomiting and diarrhea with rectal incontinence, particularly during the night, unless he arose to "defecate" at hourly intervals.

At the time of examination at the clinic he was found to have severe hyperchloremic acidosis (table 1) and bilateral renal calculi. His diet was made low in chloride (table 2) with the addition of 4 gm. of sodium bicarbonate daily for the purpose of replacement of sodium. Nine days later, although he still manifested laboratory evidence of mild hyperchloremia and acidosis, his nausea and vomiting had disappeared, polyuria and polydipsia had decreased, and he was able to sleep through the night without having to get up to "defecate." After correction of the acidosis, right nephrolithotomy was performed on October 19 1948, after which a nephrostomy tube was left in place for 13 days. During this

[1] Ferris, D. O. and Odel, H. M.: Electrolyte pattern of the blood after bilateral ureterosigmoidostomy. J. A. M. A., **142**: 634–641, 1950.

period the patient received a normal diet without restriction of sodium chloride, and all urine recovered from the nephrostomy tube was saved for determination of chloride (table 3). As soon as the nephrostomy tube was removed, the patient's diet again was made low in chloride (table 2), and at the time of dismis-

TABLE 1. *Chemical composition of the blood; first observation*

DATE	MILLIGRAMS PER 100 CC OF BLOOD		MILLIEQUIVALENTS PER LITER OF PLASMA OR SERUM		
	Urea	Creatinine	Chloride	Bicarbonate	Sodium
Normal values	40 or less	2 or less	103	27	142
3-27-39	Bilateral ureterosigmoidostomy				
3-30-39	46		114	19	
9-11-48	102	2.7	121	13	139
9-14-48	Low chloride diet plus $NaHCO_3$ 1.3 gm. three times a day				
9-20-48	104	2.8	108	20	143
9-24-48	110	2.8	107	18	141
10-2-48	74	2.4	107	27	123
10-8-48	66		102	29	139
10-19-48	Right nephrostomy; normal diet				
10-20-48	116	2.4	116	20	
10-21-48	126	3.0	106	21	
10-23-48	96	2.6	99	23	
10-25-48	96	2.7	98	21	
10-27-48	90	1.4	100	26	
10-29-48	Low chloride diet plus $NaHCO_3$ 1.3 gm. daily				
10-30-48	56		100	24	
11-1-48	Nephrostomy tube removed				
11-2-48	72		102	28	
11-8-48	72	2.8	96	32	

TABLE 2. *Low chloride diet**

CONSTITUENTS	AMOUNTS
Protein	75 gm.
Carbohydrate	260 gm.
Fat	110 gm.
Calories	2,300 gm.
Sodium	1.6 gm.
Chlorine	2.2 gm.
Calcium	0.9 gm.
Iron	0.013 gm.

* Diet is adequate in all vitamins according to recommended allowances of the National Research Council.

sal he was instructed to follow the same diet with the addition of sodium bicarbonate in a dose of 1.3 gm. daily.

The patient returned to the clinic April 20, 1949, at which time he had gained 29 pounds (13 kg.) and was entirely free from symptoms. Study of the electrolytes was begun on April 20 and continued through June 4 (forty-six days). The

TABLE 3. *Chloride in urine recovered from right nephrostomy tube*

DATE, 1948	VOLUME, CC	CHLORIDE IN URINE*	
		Total mg.	Mg. per 100 cc
Normal values			400–600
10-22	56	430	770
10-23	210	430	900
10-25	225	420	950
10-26	178	430	760
10-27	47	470	580
10-28	57	490	280
10-29	70	500	350
10-30	64	540	350
11-1	115	440	510
11-2	100	420	420

* Expressed as NaCl.

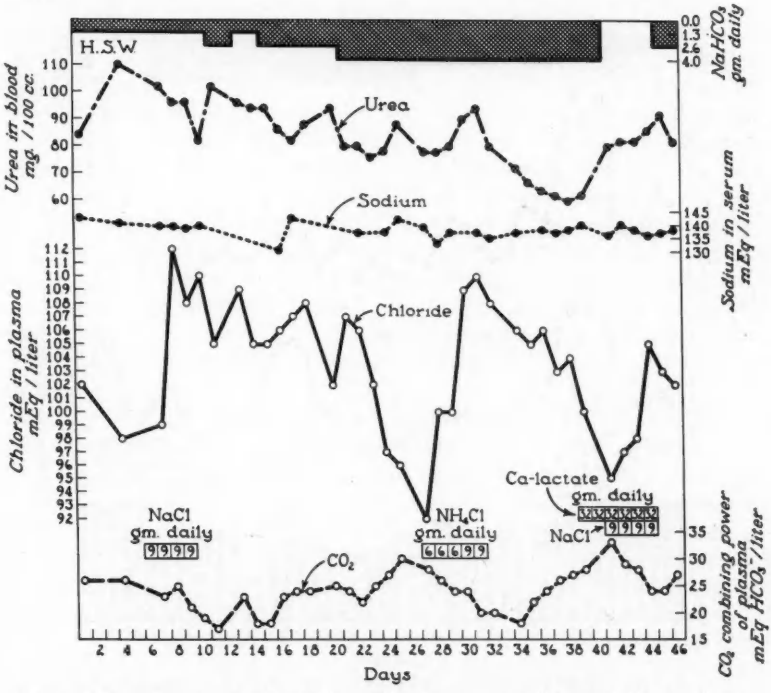

FIG. 1. Values for urea in blood, for sodium in serum and for chloride in plasma.

value for urea in the blood on April 20 was somewhat elevated (84 mg. per 100 cc) (fig. 1), which was thought to be partly on the basis of slowly progressing renal insufficiency and partly due to some degree of dehydration. The values for

chloride and bicarbonate in the plasma were entirely within normal limits. His diet was made low in salt (0.5 gm. of sodium) (table 4), and he remained on this diet throughout the period of study. Supplementary sodium bicarbonate was

TABLE 4. *Routine low salt (0.5 gm. sodium) diet**

CONSTITUENTS	AMOUNT
Protein	71 gm.
Carbohydrate	201 gm.
Fat	120 gm.
Calories	2,200 gm.
Sodium	0.5 gm.
Chlorine	0.772 gm.
Calcium	0.908 gm.
Iron	0.012 gm.

* Diet is adequate in all vitamins according to recommended allowances of the National Research Council.

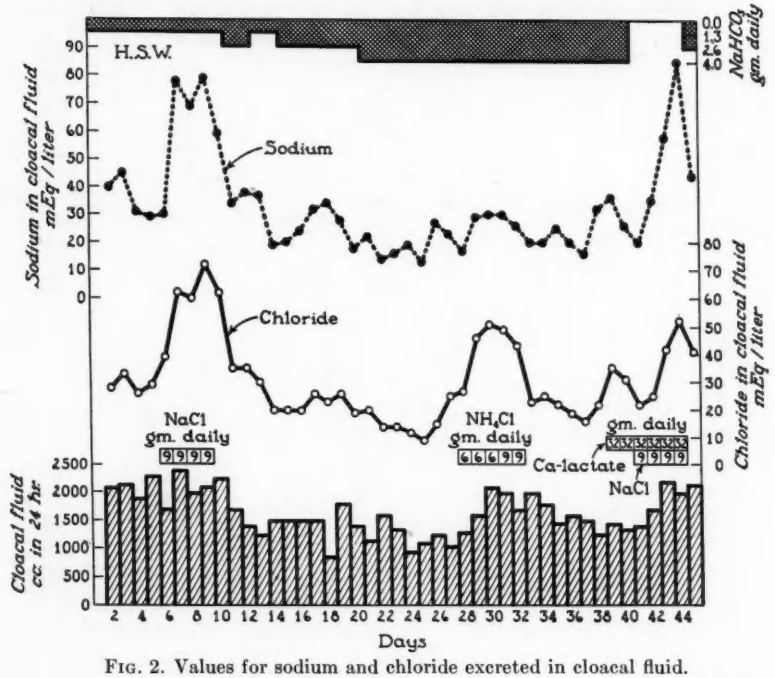

FIG. 2. Values for sodium and chloride excreted in cloacal fluid.

administered in doses indicated in figures 1 and 2. On the sixth day of the study (April 25), the patient was given 9 gm. of sodium chloride daily by mouth. Within 24 hours polydipsia developed with frequency and urgency of "urination." The second day of receiving sodium chloride (seventh day of the study) he reported that he felt weak and tired generally, had stopped perspiring and

had lost his appetite. On this day, the value for chloride in the plasma had risen to 111.8 milliequivalents per liter, although the value for carbon dioxide combining power of the plasma still remained within normal limits at 24.8 milliequivalents of bicarbonate per liter. In the 4-day period during which the patient took 9 gm. of sodium chloride daily, his weight dropped from 161 to 153 pounds (73 to 69 kg.).

Within 48 hours after administration of salt was discontinued, the value for plasma chloride had decreased to a level only slightly above normal. The value for carbon dioxide combining power continued to fall to 16.8 milliequivalents of bicarbonate per liter. Despite the fall in plasma chloride level after salt was withdrawn, the patient's symptoms continued unchanged. The dosage of sodium bicarbonate was increased to 2.6 gm. daily. Forty-eight hours later, the patient reported that he was less nervous and tired, that he had slept better the previous night with less frequency and urgency, that polydipsia and the salty taste in his mouth had disappeared, and that his appetite had improved.

During the following 12 days (fourteenth to twenty-sixth day of study), the patient remained free of symptoms. Beginning on May 16, 1949 (twenty-seventh day of study), he was given 6 gm. of ammonium chloride daily by mouth for 3 days. The dosage of ammonium chloride then was increased to 9 gm. daily; the value for plasma chloride rose sharply but there were no subjective symptoms. Twenty-four hours after administration of ammonium chloride had been increased to 9 gm. daily the value for plasma carbon dioxide combining power dropped from 24.4 to 20.1 milliequivalents of bicarbonate per liter, and on this day (May 20, thirty-first day of study), the patient reported that he felt tired, weak, and very drowsy. He also reported a return of frequency and urgency, and was of the opinion that the volume of cloacal fluid passed during the previous twenty-four hours had increased (fig. 2). The administration of ammonium chloride was stopped on May 20, 1949, and within 6 days (May 26) the value for carbon dioxide combining power had returned to normal, although hyperchloremia persisted.

On May 28, 1949 (the thirty-ninth day of study), the patient was placed on a normal diet and was given 32 gm. of calcium lactate daily by mouth, and administration of sodium bicarbonate was discontinued 2 days later. On the fourth day that calcium lactate was administered, the patient again was given sodium chloride in a dose of 9 gm. daily. Within 24 hours after administration of sodium chloride was begun, he noticed some frequency and urgency as well as increase in the volume and fluidity of stools, but otherwise he felt entirely well. On the sixth day of administration of calcium lactate the plasma chloride level had risen to 105.2 milliequivalents per liter, and there was a decrease in the value for the carbon dioxide combining power of the plasma to 23.9 mEq. HCO_3 per liter. On this day, the patient noticed a distinct salty taste in his mouth, without the other symptoms and signs characteristic of hyperchloremia. The following day he resumed a qualitative low chloride diet (table 4), administration of both calcium lactate and sodium chloride was discontinued, and on dismissal he was instructed to take 2.6 gm. of sodium bicarbonate daily.

He has continued this program for about a year and has had no symptoms.

He returned for re-examination once, and on this occasion the electrolyte pattern of his blood was essentially normal.

Only the intelligence and unusual co-operation of the patient whose case we are reporting made this study possible. The patient was meticulous in regard to his diet, medications and collection of specimens, and his reporting of subjective manifestations was regarded by us as accurate.

Although on the basis of recurrent infections of the upper part of the urinary tract in the past 11 years and bilateral renal calculi, the patient undoubtedly has some degree of renal parenchymal damage to account in part for his low-grade renal insufficiency, the fluctuation in urea levels, and the persistently near normal levels for creatinine in the serum lead us to assume that his renal function is essentially adequate and that elevations in the levels of urea and sulfate in the blood may be the result of absorption of these substances from the urine across the rectal mucosa. That his episodes of hyperchloremia have not developed on the basis of decreased excretion of salt by the kidney was shown by the relatively normal concentrations of chloride in the urine recovered from his nephrostomy tube (table 3). We are of the opinion that if we were to institute continual lavage of the lower part of the bowel with tap water for a period of several days, we might be able to "wash out" sufficient urea and sulfate to reduce to levels of these substances in the blood to normal or near normal.

That hyperchloremia may exert a diuretic effect is evident from examination of figure 2. The increased volumes of cloacal fluid during the periods of hyperchloremia coincide closely with the patient's observation of frequency and urgency of "urination" during the periods when he was taking either sodium chloride or ammonium chloride.

The increased concentrations of both sodium and chloride in the cloacal fluid during the period of increased intake of sodium chloride, closely parallel the rise in the level of chloride in the plasma. In the case of chloride, it is impossible to ascertain whether this occurs because an excess amount of ingested chloride is not absorbed initially from the bowel, but is excreted unchanged as sodium chloride, or because urine containing an unusually high concentration of chloride is eliminated before a maximal amount of chloride can be reabsorbed from the urine across the rectal mucosa. Since, from repeated determinations of electrolytes in feces of normal subjects and of patients suffering from conditions other than that under discussion in the present report, it has been noted that sodium usually is found in feces in infinitesimal amounts,[2] we may assume for all practical purposes that the concentrations of sodium in cloacal fluid represents the amounts of that ion excreted by the kidneys. Therefore, one might speculate that the increased concentrations of sodium in cloacal fluid during the period when the patient was taking sodium chloride occurred because an excess amount of ingested sodium was not absorbed from the gastro-intestinal tract but was excreted unchanged as sodium chloride, or because the amount of sodium initially absorbed in excess of that needed to satisfy normal requirements for sodium in serum was excreted by the kidneys and was not reabsorbed

[2] Power, M. H.: Personal communication to the authors.

from the urine across the rectal mucosa. Acceptance of the latter supposition plus the relatively minor variations in levels of serum sodium during hyperchloremic episodes would lend support to our contention of essentially adequate renal excretory function, at least in so far as the excretion of sodium is concerned, and might further suggest that reabsorption of electrolytes across the rectal mucosa is selective in nature.

When the patient was given ammonium chloride, hyperchloremia and acidosis developed (fig. 1), with a corresponding increase in the concentration of chloride in the cloacal fluid, but with only minor increase in the concentrations of sodium. The slight rise in values for sodium in the cloacal fluid we have interpreted as being the result of the diuretic effect of administration of ammonium chloride since administration of ammonium chloride would probably result in excretion of both sodium and potassium in the urine. In our opinion this interpretation lends further support to the theory of normal renal excretion of sodium and raises the possibility of inhibition of sodium reabsorption across the rectal mucosa.

Careful study of the behavior of chloride and bicarbonate levels in the plasma during the periods of induced hyperchloremia and acidosis suggests that hyperchloremia may develop rapidly after the ingestion of significantly large quantities of chloride, and that this situation may antedate the development of acidosis by one or more days. Conversely, it would appear that in correction of the electrolyte imbalance by restriction of salt and supplementation with sodium bicarbonate, values for the carbon dioxide combining power of the plasma may return to normal or near normal levels before the hyperchloremic state is corrected. If the subjective observations of the patient are to be relied on, it would appear that thirst, polydipsia, anhidrosis, polyuria, frequency, urgency, anorexia and a salty taste in the mouth are factors of hyperchloremia, whereas weakness, fatigability, drowsiness and a feeling of malaise or prostration may be associated more with acidosis.

In order to explore the possibility that an attempt to bind chloride to a cation less readily absorbed from the bowel than sodium might result in decreased reabsorption of chloride, the patient was given large doses of calcium lactate by mouth in conjunction with sodium chloride. Hyperchloremia did not occur until the fourth day of ingestion of salt, and then only a moderate rise in plasma chloride was noted. It is interesting to note that in the presence of calcium lactate the ingestion of salt produced a less marked effect on the carbon dioxide combining power of plasma than when salt was given alone.

COMMENT AND SUMMARY

The specific mechanism by which hyperchloremic acidosis develops after bilateral ureterosigmoidostomy still is not clear. In our opinion, however, the present study substantiates the supposition that reabsorption of chloride from urine stored in the rectum and sigmoid is responsible, since hyperchloremia developed after administration of both sodium chloride and ammonium chloride.

Increased excretion of sodium with relatively small fluctuation in levels of

serum sodium in the presence of hyperchloremic acidosis suggests to us that excess amounts of sodium are excreted by the kidneys but are not reabsorbed across the rectal mucosa. This would further substantiate a hypothesis that absorption of electrolytes and other substances across the wall of the rectum and sigmoid is selective in nature.

The tardy development of hyperchloremia and absence of clinical manifestations of acidosis from the ingestion of salt in the presence of calcium lactate suggest that this substance may retard absorption of chloride across the rectal mucosa and that either calcium lactate or calcium carbonate might be more suitable "alkalinizing" agents than sodium bicarbonate. Further study, however, is required before this possibility can be proved or disproved.

The results of this study as well as management of other patients who have had hyperchloremic acidosis after bilateral ureterosigmoidostomy offer convincing evidence that this complication can be adequately controlled by giving the patient a diet restricted in sodium chloride, with the supplementary use of sodium bicarbonate, in doses sufficient to effect adequate replacement of bicarbonate without producing alkalosis. As stated in our previous paper, "the degree of salt restriction in the diet and the dosage of sodium bicarbonate cannot be standardized but must be regulated according to the electrolyte response in each patient."[1] If a commercial salt substitute is used, care should be taken that the product does not contain one or more "chloride" salts as ingredients.

Adequate explanation is wanting as to why hyperchloremic acidosis develops early after bilateral ureterosigmoidostomy in some cases whereas in others clinical or laboratory evidence of electrolyte imbalance may not appear for long periods thereafter.

Admittedly, no definite conclusions can be drawn from observations made in the study of one case, but we believe that certain features may be considered of significance in pointing the way to further investigation.

CONSIDERATION OF PROBLEMS INCIDENT TO PERFORMANCE OF URETERO-ENTEROSTOMY: REPORT OF A TECHNIQUE

W. F. LEADBETTER

From the Department of Urology, Tufts College Medical School, New England Center Hospital and Pratt Diagnostic Clinic, Boston, Mass.

The following comments on the technical performance of uretero-enterostomy are suggested by the writer's experiences, good and bad, in performing this operation. They are offered at this time to bring up once again a discussion of basic principles. This seems warranted inasmuch as the variety of published techniques, all purported to give good results, leave the average urologist wondering which operation may be expected to give the best results, and consequently the one that should be mastered. Unfortunately, the limited number of cases available for operation to any but surgeons in large hospitals and clinics make it virtually impossible to personally test varying techniques on enough cases to allow the operator to be sure which technical factors are responsible for good and poor results.

In view of the reports of Nesbit[1] and Cordonnier[2] advocating some type of direct bowel-ureteral anastomosis, and those of Huggins,[3] Brunschwig,[4] Kerr and Colby[5] advocating simple stab wound implantations of the ureter into the bowel, one wonders whether there is any advantage in performing a more difficult operation utilizing the Coffey principle of formation of a submucous tunnel. Many times I have heard surgeons say 'the simplest technique is the best.' I wonder whether this is true. There seems to be no doubt that good results have been obtained by the use of any method now generally utilized and perhaps no one method fits all cases ideally.

The only way to settle this matter, so far as I can see, is for relatively disinterested surgeons to pass on results obtained by different techniques after a considerable period of observation in an effort to analyze the factors which have led to poor results or those which have given good results. This has never been done to my knowledge and would make an interesting study.

However, it is difficult, even for the operating surgeon, to evaluate his own results accurately because so many factors are involved other than the 'method' utilized in joining the ureter and bowel. Thickness of bowel, redundancy or lack of it, preparation of the bowel, soiling of the operative field, redundancy of the ureter, size and thickness of the ureter, alignment of the ureter, relation of peritoneal edges to ureter in close proximity to the bowel—all may have as much to do with the ultimate result as the 'method' itself.

[1] Nesbit, R. M.: Ureterosigmoid anastomosis by direct elliptical connection: A preliminary report. J. Urol., **61:** 728–734, 1949.

[2] Cordonnier, J. J.: Ureterosigmoid anastomosis. J. Urol., **63:** 276–285, 1950.

[3] Huggins, C. and Johnson, M. A.: Cancer of bladder and prostate. J. A. M. A., **135:** 1146–1152, 1947.

[4] Brunschwig, A.: Complete excision of pelvic viscera for advanced carcinoma. Cancer, **1:** 177–183, 1948.

[5] Kerr, W. S. and Colby, F. H.: Pelvic lymphadenectomy and total cystectomy in treatment of carcinoma of bladder. Trans. Am. Assoc. Genito-Urin. Surg., **41:** 57–66, 1949.

In my own experience, utilizing the Coffey I technique, it has been apparent, from autopsy studies of the few patients who have thus far died, that there have been three principal causes for ureteral obstruction and consequent dilatation of the upper urinary tract when it existed. (No patient died from urinary tract disease or showed signs of active renal infection.) These factors have been 1) stricture of the tip of the ureter at the point where it made contact with the bowel lumen; 2) stenosis of the ureter due to peri-ureteral scar in the course of its passage through the bowel wall; 3) obstruction due to angulation or fibrosis about the lower ureter just above the site of entry into the tunnel in the bowel wall.

I have felt that strictures of the terminal ureter are more or less inevitable when any 'implantation' technique is used, inasmuch as healing of the ureteral tip occurs in the presence of infection and slough, and contraction necessarily often results. This problem would seem to be effectively eliminated only by utilization of a 'direct anastomosis' technique.

Stenosis of the ureter in its course through the bowel wall is undoubtedly a hazard of any 'tunnel' technique and may be due to organizing hematoma, infection or reaction by contamination from the bowel lumen, or leakage of urine or bowel contents from the bowel into the tunnel about the ureter perhaps due to retraction of the ureter or too large an opening in the bowel mucosa. These troubles would seem best prevented by careful hemostasis and the use of the 'direct anastomosis' technique which forms an almost water-tight anastomosis.

Stricture may also result from a tight implantation. Improper formation of the tunnel in the bowel wall due to failure to carry the incision deep enough toward the bowel mucosal layer and to dissect the mucosa from the overlying muscle layers far enough laterally on either side is, I believe, the chief cause. If this is not done properly, the ureter is made to lie between a relatively non-yielding submucosa and resutured muscle layers. When it is performed properly, the mucosa acts as a hammock which invaginates into the bowel and a 'tight' anastomosis does not result. Schnittman's paper[6] has been of great help to me in this regard, since I am sure that formerly my bowel dissection was inadequate.

Obstruction due to troubles above the anastomosis itself can be prevented by, first, careful measurement of the ureter before anastomosis so that no redundancy results; in addition by proper alignment of the bowel, anastomosis and ureter as the latter emerges from the retroperitoneum.

It has seemed to me that there are arguments pro and con which must be considered in relation to the direct anastomosis technique. For instance, if one is to implant dilated ureters by either Nesbit's or Cordonnier's method, I believe there is considerable chance that gas or fecal material may pass from the bowel into the ureter. I doubt that this occurs when the tunnel principle is used. In fact we have never demonstrated any reflux from the bowel into the ureter by barium enema when thin barium mixtures have been used. Perhaps a valve as such is not formed, but in any case this type of uretero-enterostomy appears to function in much this way. In implanting or anastomosing normal ureters, so

[6] Schnittman, M.: Results in uretero-intestinal anastomosis. J. Urol., **60**: 421–434, 1948.

long as the lower ureter at the site of implantation is not obstructed, it would seem that a tunnel is unnecessary, though on the other hand it would do no harm provided a stricture did not result. I believe there is intrinsic value in the use of the Coffey principle and that technical improvement in this type of ureteroenterostomy may lead to a more satisfactory method of performing this most intriguing operation. With these thoughts in mind, I decided to perform ureteroenterostomy by making a direct anastomosis between the mucosa of the bowel and the full thickness of the ureteral wall, at the same time constructing a trough or tunnel to enclose the distal ureteral segment—a combination of the direct anastomosis and tunnel principles.

We have performed the operation on 8 cases and will discuss it under the following headings: 1) preoperative preparation of the patient; 2) abdominal exploration; freeing of the sigmoid; choice of sites for anastomoses; 3) identification, division, and preparation of the ureters; 4) preparation of bowel for anastomosis; 5) performance of the anastomosis; immobilization of the bowel; 6) postoperative care of the patient; 7) results.

PREOPERATIVE PREPARATION OF PATIENT

This requires 4 days and begins with catharsis using castor oil. A low residue, high protein diet is given. Enemas are used once each day with care to have the patient completely empty the bowel. On the morning of operation an enema is given and the lower bowel subsequently thoroughly washed out in the operating room with warm saline through a soft rectal tube. So far as antibiotics are concerned, to render the large bowel bacterial count as low as possible, we first used streptomycin, 0.5 gm. 4 times a day by mouth. More recently, since the report of Dearing and Heilman[7] from the Mayo Clinic, we have used 500 mg. aureomycin 4 times a day by mouth. Vitamins and blood are used as indicated. The evening before operation a Miller-Abbott tube is passed into the stomach. If it goes through into the duodenum, well and good; but if it does not, we are content to leave the tip in the stomach because, in the absence of real intestinal obstruction, we have found this provides for gastric and small bowel drainage quite as satisfactorily as a tube in the jejunum, and in addition eliminates the possibility of a collection of fluid in the stomach above the tip of the tube which sometimes leads to vomiting in spite of the presence of the tube in the jejunum. Spinal anesthesia has been used as the basic anesthesia supplemented as deemed necessary by the anesthetist.

OPERATION; EXPLORATION, FREEING OF SIGMOID IF NECESSARY, CHOICE OF SITES FOR URETERO-INTESTINAL ANASTOMOSES

For this we prefer a long, midline incision from the pubis nearly to the xiphoid. When the operation is to be done for cancer, after palpation of the liver, kidneys, retroperitoneal glands, and bladder, the small bowel is packed off and the sigmoid inspected and freed from the point where it leaves the left gutter to below

[7] Dearing, W. H. and Heilman, F. R.: Effect of aureomycin on bacterial flora of intestinal tract of man. A contribution to preoperative preparation. Proc. Staff Meet. Mayo Clinic, **25:** 87–102, 1950.

the pelvic brim, thus giving as much mobility to this portion of the bowel as possible. The site chosen for anastomosis between the left ureter and bowel is just at the beginning of the sigmoid at the point where the bowel leaves the left gutter. Anastomosis is performed through an incision in the taenia on the anterior surface of the bowel as close to the mesenteric border as possible. We have found that the more natural course for the ureter from the retroperitoneum is through the mesentery of the upper sigmoid. When the anastomosis is done on the posterior surface of the sigmoid, it is difficult to be sure just how the ureter and the bowel adjust themselves when the bowel is replaced after the anastomosis, the chief difficulty, I think, being the question of redundancy or angulation

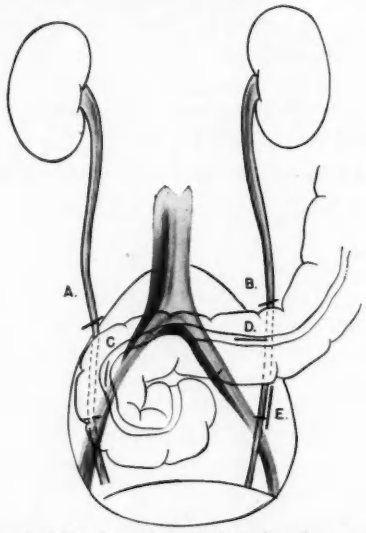

FIG. 1. Schematic drawing showing sigmoid bowel and upper urinary tract in relation to aorta and common iliac vessels. Sites for projected implantation of ureters into bowel are indicated at *C* and *D*. Sites of incisions in retroperitoneum for identification and division of ureters are indicated at *A* and *E*. Incision in mesentery of sigmoid through which left ureter is to be brought is indicated at *B*.

of the ureter. The site for anastomosis of the right ureter to the bowel is determined by allowing the sigmoid to curve gradually across the midline without any redundancy to a point where it lies over the right ureter. We deliberately choose high sites in the bowel and well above the pelvic brim for two reasons. We think this results in redundant bowel below the anastomosis which serves as a urine reservoir and leads to better storage capacity and consequently less bowel frequency. We prefer to leave the pelvic portion of the ureters undisturbed in cancer cases and remove them together with all peri-ureteral tissues and common iliac glands along with the bladder. Postmortem examination of two cases of bladder cancer after uretero-enterostomy and cystectomy showed recurrent cancer at the sites of uretero-intestinal anastomosis, presumably because of involvement of lymphatics of the ureter. The approximate sites in the bowel

chosen for uretero-enterostomy, as well as incisions in the posterior peritoneum for division of the ureters, are shown in figure 1.

ISOLATION, DIVISION AND PREPARATION OF THE URETERS

The left ureter is exposed through a small incision in the retroperitoneum below the proximal sigmoid just above the pelvic brim. It is divided just above one clamp placed at this point. We believe that circulation in the proximal ureter may be arrested for a considerable distance proximal to a clamp which is allowed to remain on the ureter after its division. Resulting ischemia of the distal portion of the ureter may impair healing. The proximal cut end of the ureter is

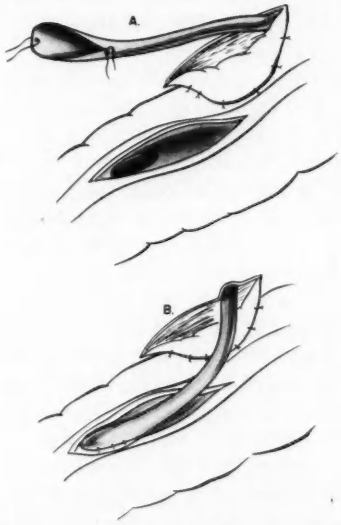

FIG. 2. *A*, suturing of mesenteric peritoneum to bowel wall close to site of trough which has been prepared in taenia. Also shown is ureter prepared for anastomosis. *B* demonstrates completed anastomosis between full thickness of ureteral wall and bowel mucosa.

allowed to drain freely and bleed freely. The distal stump is tied and pushed down into the pelvis. The proximal ureter is freed very gently from its bed superiorly to a point behind the mesenteric border of the sigmoid through which an incision is made and through which the ureter is gently pulled. Under these conditions the blood supply of the ureter is provided by the lumbar arterial branch which enters the proximal ureter a relatively short distance above its severed end, much closer than if one were to utilize the pelvic portion of the ureter for anastomosis which, in our experience, almost always means dividing the arterial branch from the common iliac. Use of the lumbar ureter means, therefore, better blood supply of that portion of the ureter used for anastomosis. The ureter is measured accurately in relation to the point of anastomosis chosen on the sigmoid so that no redundancy or tension is likely after the anastamosis has been performed. Usually a short segment is sacrificed. The end of the ureter

is prepared for anastomosis by incising it for about 8 millimeters on the under surface and trimming off the sharp, square, distal points to provide an elliptical anastomosis as described by Nesbit. (See fig. 2, *A*.)

PREPARATION OF BOWEL FOR ANASTOMOSIS

A short segment of bowel in relation to the incision in the mesentery is chosen and a row of three or four fine silk sutures placed to approximate the inferior cut margin of the mesenteric peritoneum directly to the mesenteric border of the bowel. (See fig. 2, *A*.) The purpose of this is to lead the ureter directly to the site of anastomosis in the bowel without leaving any sharp peritoneal edge between the point where the ureter emerges from the loose connective tissue of the retroperitoneum and the point where it enters the bowel wall. An incision 2.5 cm. in length is made slightly diagonally across the anterior taenia from the mesenteric margin of the bowel. A trough is created in the bowel wall by incising the various layers down to the mucosa itself and gently stripping the mucosa away from the overlying muscularis thus forming generous flaps on either side, as described by Schnittman.[6] This is accomplished by incising the layers of the bowel wall very carefully at the distal end of the trough until the mucosa is identified, sometimes by actually perforating it. Having done this one can then dissect back along the incision within the proper layer. This, we think, is very important. It allows the mucosa to invaginate into the bowel lumen easily and after the ureter is placed in the trough the muscular flaps may be sutured over the ureter without compressing it in the least. The incision is carried back to the mesenteric margin of the bowel so that the ureter is subsequently led directly into this trough. The formation of the trough, in my experience, is often inadequately performed in that dissection is rarely carried deep enough toward the mucosa and the flaps of muscularis are not dissected laterally far enough on either side. Actually the dissection of the muscularis is best accomplished by stripping away the mucosa rather than stripping up the muscular layers, because if one gets into the proper plane of cleavage the mucosa seems to push away quite easily from the muscularis without much bleeding or trauma.

THE ANASTOMOSIS

A short opening is made through the mucosa at the distal end of the trough if it has not already been produced, and then a direct anastomosis performed between the prepared end of the ureter and the mucosa of the bowel, using interrupted sutures of fine arterial silk. This is accomplished by first placing two key sutures (fig. 2), one through the proximal end of the slit in the ureter, and one through the tip of the ureter. These are passed through the mucosa of the bowel proximally and distally, so far as the incision in the bowel mucosa is concerned, and tied. The intervening margins of ureter and mucosa of bowel are then sutured together using an additional four or five fine silk sutures on either side. The mucosa of the bowel is so delicate that it can be made to conform to the length of ureteral opening between the two key sutures without great diffi-

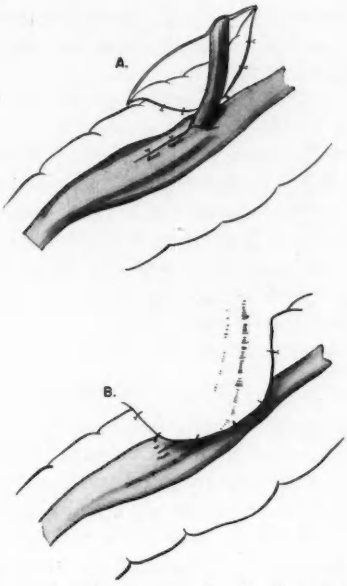

FIG. 3. *A*, completed uretero-enterostomy; showing 2 sutures used to close margins of incision in bowel wall over ureter. *B*, superior margin of mesenteric peritoneum shown pulled down and sutured to bowel wall to extraperitonealize areas of anastomosis.

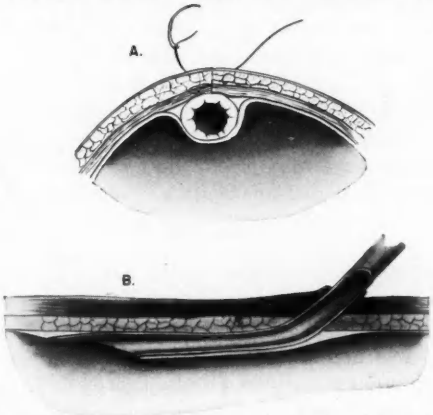

FIG. 4. Cross and longitudinal sections through bowel at site of uretero-enterostomy indicate author's concept of anatomical relationship after uretero-enterostomy has been properly performed.

culty, and practically a water-tight anastomosis is produced. No further fixation of the ureter is done, but the muscular flaps of bowel wall are then sutured loosely over the ureter using two or three fine silk sutures. Retroperitonealization of the

anastomosis and fixation of the bowel is accomplished by suturing the superior edge of the mesenteric peritoneum over the site of anastomosis with very fine silk sutures. (See fig. 3, *A* and *B*.)

The right ureter is implanted utilizing the same technique, the ureter being approached through the posterior peritoneum directly at the point where anastomosis is to be done, well above the pelvic brim. It is freed only for a short distance, divided, and the bowel wall sutured to the margin of peritoneum below the point at which the ureter emerges. Anastomosis is then done in exactly the same way as on the left side and the bowel is immobilized by bringing the lateral flap of peritoneum over the area of anastomosis in the bowel just as on the left side. Additional sutures are placed to attach the sigmoid between anastomotic sites to the posterior peritoneum so that no small bowel hernia may develop between the sigmoid and posterior peritoneum.

POSTOPERATIVE CARE OF THE PATIENT

This has proved surprisingly simple. A long, soft rectal tube with multiple perforations is left in the rectum and held in place by adhesive strapping. It is connected to gravity drainage and irrigated with normal saline every 2 hours to keep the lumen free from fecal material. Usually urine is draining from the tube by the time the patient returns from the operating room. The Miller-Abbott tube is connected to gentle suction. Crysticillin and streptomycin are given intramuscularly for a few days until aureomycin can be taken by mouth. Intravenous fluids and blood are administered as indicated in terms of blood loss, urine output, and hydration. Complete blood chemistries are obtained daily for the first few days or until it is certain that renal function is satisfactory. Gastric suction is discontinued as soon as peristalsis is established, usually on the second or third postoperative day. Fluids and diet are started by mouth as soon as the patient tolerates them. The rectal tube is removed on the fifth or sixth day. Patients are instructed from the start to hold urine as long as possible inasmuch as habit frequency may otherwise develop and be difficult to modify. Excretory urograms are obtained within 2 weeks after operation.

RESULTS

During this past year ureterosigmoidostomy has been performed utilizing this technique on 8 patients. Bilateral operation was done in all but 1 case. The opposite ureter was ligated in this instance because the kidney had been blocked for some time and was nonfunctioning by excretory urogram. Indications for operation were interstitial cystitis in 1 case, cancer of the bladder or prostate in 7. Subsequent or simultaneous prostatovesiculocystectomy with regional pelvic gland dissection was done in 6 cases. One patient died 1 week after operation from pulmonary emboli. The postoperative period and subsequent course of the surviving 7 patients have been completely free from episodes of pyelonephritis. The most impressive, immediate result has been the free drainage of urine from the rectum from the time of operation and the absence of symptoms relative to the upper urinary tract. No evidence of leakage at the site of anastomosis has been noted and the lack of febrile reaction has been striking. One patient

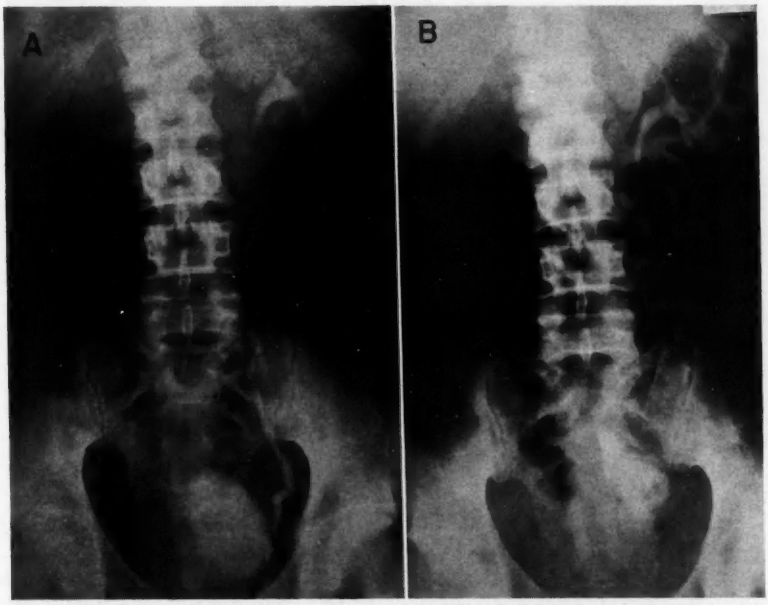

FIG. 5. First case in which this technique was utilized. Patient a man aged 43 with extensive carcinoma of prostate. Right kidney nonfunctioning. No response to orchiectomy Palliative left uretero-enterostomy. *A*, preoperative; *B*, postoperative urograms.

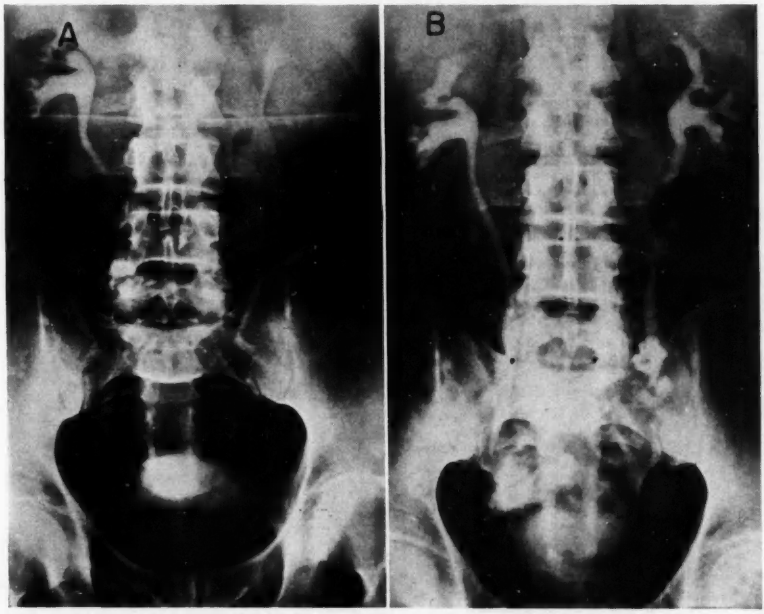

FIG. 6. Case 2. Man aged 50 with infiltrating carcinoma of bladder. Two-stage bilateral uretero-enterostomy and radical prostatocystectomy. *A*, preoperative; *B*, postoperative urogram.

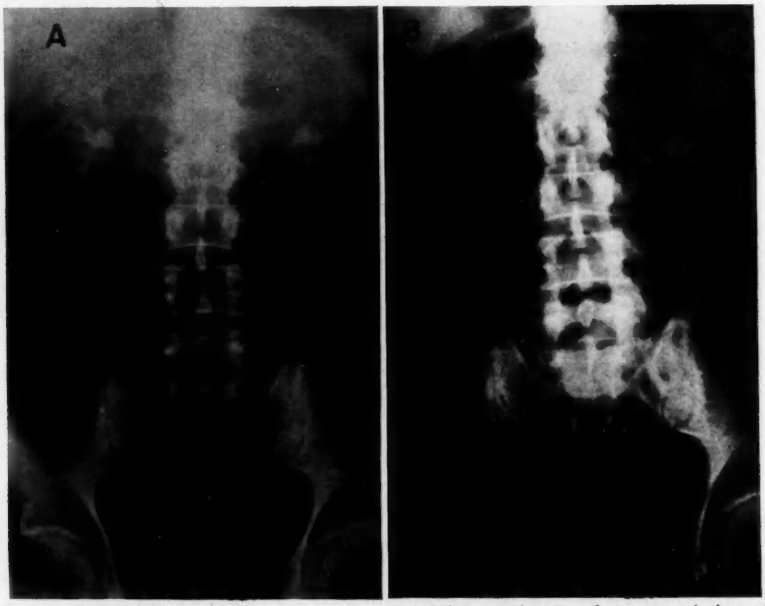

FIG. 7. Case 3. Man aged 61 with locally extensive carcinoma of prostate (triangular ligament involved). No apparent response to estrogen therapy. Bilateral uretero-enterostomy and radical prostatocystectomy with excision of triangular ligament. *A*, preoperative; *B*, postoperative urogram.

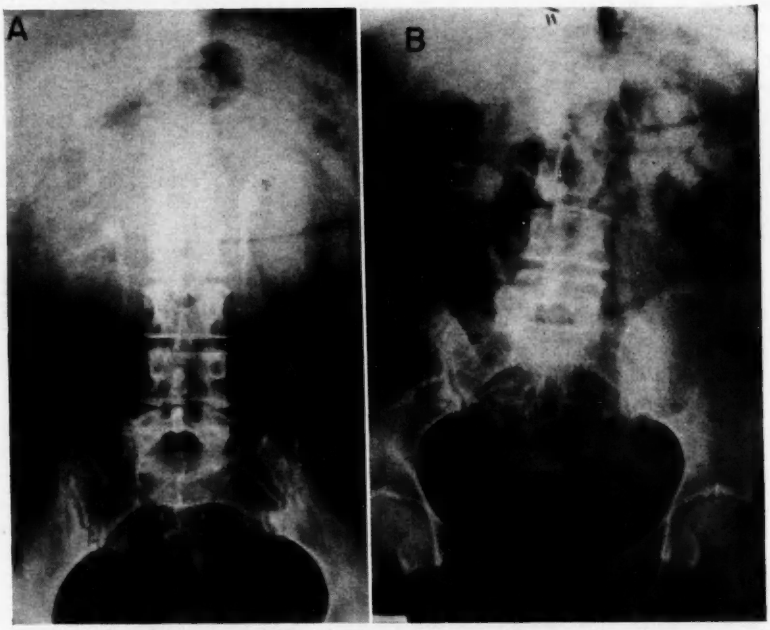

FIG. 8. Case 4. Woman aged 65 with 10 year history of intractable urinary complaints due to interstitial cystitis. Bilateral uretero-enterostomy with complete relief. *A*, preoperative; *B*, postoperative urogram. This was the poorest result.

passed a small stone from the left kidney during the postoperative period. In no case has there been a significant elevation of nonprotein nitrogen. Mild acido-

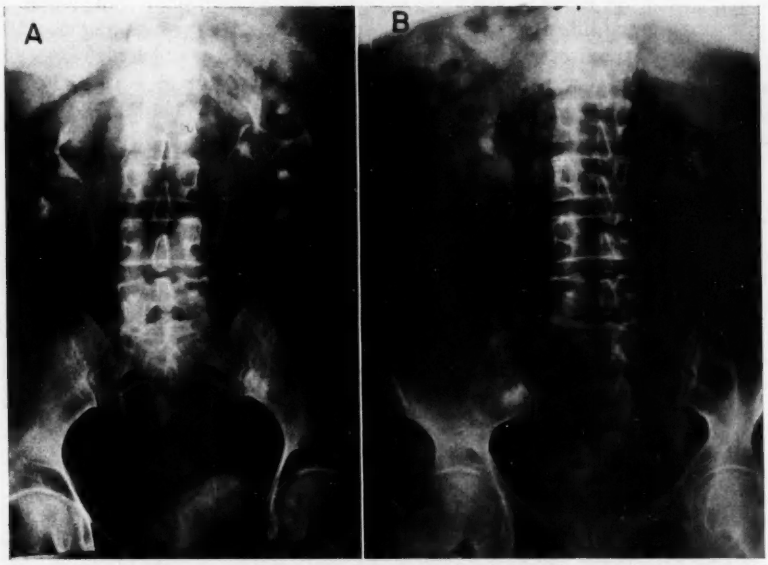

FIG. 9. Case 5. Woman aged 58 years with extensive infiltrating carcinoma of bladder. *A*, filling defect in bladder and also changes in kidneys with loss of cortex suggestive of chronic pyelonephritis. Small calculus in lower calyx of left kidney observed in dye. Bilateral uretero-enterostomy and radical cystectomy. *B* (film transposed) shows postoperative urogram. Stone in lower calyx of left kidney subsequently passed.

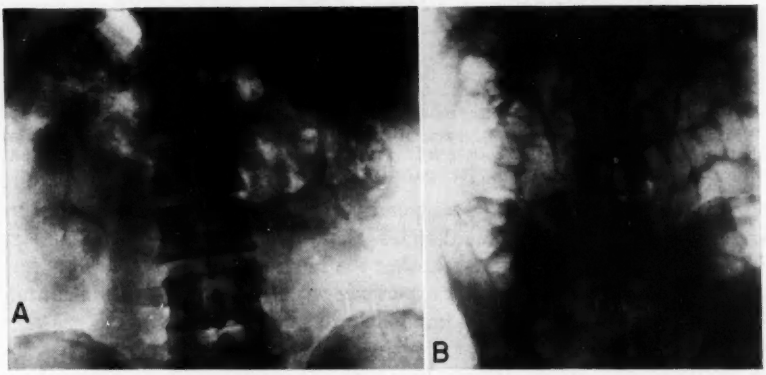

FIG. 10. Case 6. Man aged 55 years with locally extensive prostatic carcinoma and involvement of triangular ligament. Bilateral uretero-enterostomy and cystectomy together with excision of triangular ligament. *A*, preoperative; *B*, postoperative urogram.

sis has been noted in most of the cases. Excretory urograms obtained early in the postoperative period have shown either no hydronephrosis and hydro-ureter

or slight hydronephrosis and hydro-ureter, except in 1 case where moderately severe dilatation of renal pelves and ureters was noted on both sides. In that case we were not satisfied with the conduct of the operation. The patient was quite obese and difficulty was encountered in securing proper alignment and positioning of the ureters. In spite of the hydronephrosis and hydro-ureter, the patient is doing very well thus far, has had no febrile episodes, and has been completely relieved of her symptoms due to interstitial cystitis. Results from this procedure have been the best obtained by the author. Figures 5, 6, 7, 8, 9,

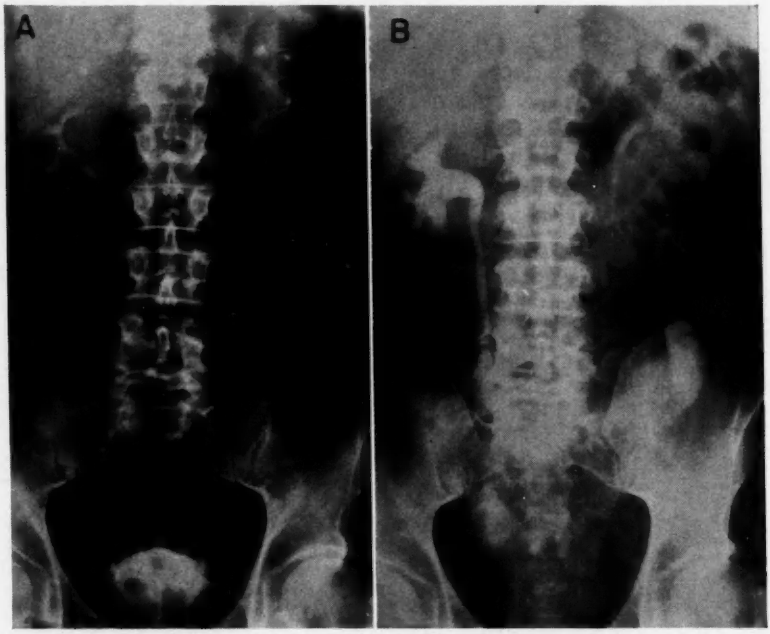

FIG. 11. Case 8. Man aged 58 years with locally extensive prostatic carcinoma which failed to respond to 6 months' estrogen treatment. Bilateral uretero-enterostomy and radical prostatocystectomy done. *A*, preoperative; *B*, postoperative pyelogram.

10, and 11 show the pre- and postoperative urograms obtained on the 7 surviving patients. Follow-up is limited to less than a year, but late follow-up studies will be reported subsequently. Whether the method itself is responsible for the results or whether my own greater experience with the general problem of uretero-enterostomy is the answer, it is impossible to know.

CONCLUSION

Several points in technique are discussed which seem to show that the direct anastomosis technique, as practiced by Nesbit and Cordonnier, is likely to eliminate some of the factors which lead to poor results from uretero-enterostomy.

In order to avoid the possibility of reflux of gas and feces from the bowel, particularly in the case of dilated ureters, it is suggested that the tunnel technique may be necessary, and in any case does no harm unless it can be shown that it inevitably leads to stricture of the ureter in its passage through the bowel wall.

A method of uretero-enterostomy is presented which combines the principle of direct anastomosis of the ureter to mucosa of bowel together with the formation of a submucosal tunnel.

This method has been utilized in the performance of uretero-enterostomy on eight patients. The results have been good to excellent.

URETERAL MEATOTOMY WITH THE FINE-WIRE ELECTRODE

DAVID M. DAVIS

From Department of Urology, Jefferson Medical College, Philadelphia, Pa.

A fine-wire electrode of the kind known as the Timberlake or the Hyams has been found very useful in performing ureteral meatotomy.

The fine wire is extruded from the insulating sheath to a distance exactly equal to the desired length of the meatotomy incision. Using a McCarthy pan-

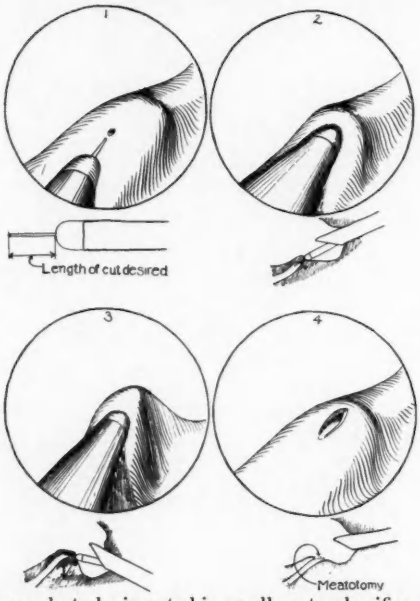

FIG. 1. *1*, Electrode ready to be inserted in small ureteral orifice. Diagram below shows how length of cut is determined by length of wire left exposed. *2*, Electrode thrust into ureter as far as it will go, insulating sheath acting as a stop. *3*, Oular end of panendoscope being depressed, ureteral ridge is pried up, bringing wire in close contact with roof of ureter. *4*, After cutting current is turned on, ureteral ridge falls away from electrode, leaving clean, bloodless cut exactly same length as exposed segment of wire.

endoscope, the wire is thrust into the ureter as far as it will go, the end of the insulating sheath acting as a stop. The outer end of the panendoscope is then greatly depressed, so that the electrode pries the ureteral ridge up toward the dome of the bladder and places it under tension. The bladder is well filled with water so that no other part of its wall will be injured. The cutting current is set at a point almost as high as for transurethral resection, so that a quick, clean and bloodless cut will be made. A momentary touch on the foot switch produces a clean, bloodless cut of the same length as the extruded portion of the wire, the ureteral ridge falling away from the electrode automatically and back to its normal position.

The advantages of this method appear to me as follows: 1) no special apparatus is required; 2) the exact length of the cut can be determined beforehand, and it is practically impossible for it to be made any longer, thus avoiding all danger of extravasation; and 3) there is no bleeding.

The method has been in use in my clinic for more than ten years, with great satisfaction, and appears to be as nearly fool proof as any urological procedure can be.

255 S. 17th St., Philadelphia 3, Pa.

DISCUSSION

Dr. George W. Fish (New York, N. Y.): Mr. Chairman, I would like to ask a question of Dr. Ferris; that is, whether or not there was any marked difference in the reabsorption rate of the cases he discussed, in infants or adults.

Dr. William J. Baker (Chicago, Ill.): I would like to show a few slides relating to the interesting presentation of Dr. Taylor.

(Slide) I am well aware that the first two sets of slides are not primary carcinoma. This is a ureterogram of a 38-year-old woman, with all the symptoms of a tumor lesion of the urinary tract. This is her gross specimen removed—slide which, of course, is a polyp.

(Slide) This is a high power microphotograph of the polyp itself.

(Slide) This is the high power microphotograph, again.

Now, this patient, as you would guess, has been alive more than 4½ years since her nephro-ureterectomy.

(Slide) This is a slide of a man, 32 years of age, with a peculiar spindle-shaped swelling in the middle third of the ureter.

(Slide) This is the gross specimen. I might say that this was a polyp which was removed from the ureter by electrical methods, and the ureter and kidney left intact.

(Slide) This is a low power microphotograph of the tumor.

(Slide) This is a high power microphotograph of the same. He is alive 7½ years since the removal of his tumor.

(Slide) This is a man, 60 years of age, with hematuria. The urogram emphasizes to you the ebonizing vertebra in the picture.

(Slide) This is the gross specimen which was removed, showing the lesion in the midlower portion of the ureter.

(Slide) This is a microphotograph of the same lesion, which was highly malignant, and the man was dead in 18 months with metastatic lesions.

(Slide) This is the removed specimen of a male aged 54, and you see the lesion in the lower end of the ureter. This mass is kidney, and the photographer really put it out in front unnecessarily.

(Slide) This is a microphotograph of the lesion. I would guess that this man probably will have a poor prognosis. It has been only 7 months since we removed the kidney and ureter.

(Slide) This is the urogram of a male aged 64. This is the gross specimen slide removed, emphasizing the point that the lesion occurred at the lower end of the ureter.

(Slide) This is the microphotograph of the same lesion of papillary carcinoma. This man is well 4½ years since operation.

(Slide) This is a gross specimen of a male aged 61, with a lesion of the lower end of the ureter.

(Slide) This is a microphotograph of the same. His prognosis was very poor. He was dead within 6 months of metastatic lesions.

(Slide) This is in a female aged 68, a peculiar lesion in the lower end of the ureter.

(Slide) This is the gross specimen; and you can see the tumor involves the whole lower end of the ureter.

(Slide) This is the microphotograph, showing papillary carcinoma, infiltrating.

(Slide) This is a metastatic lesion of the tibia from this lesion.

(Slide) This is a microphotograph of this bone metastasis. She was dead in 7 months from metastatic lesions.

(Slide) This is a male aged 58, who had had a nephrectomy for pyelonephritis. He came to us for removal of the remaining ureter. This is the entire ureter, with cuff of the bladder.

(Slide) This is a microphotograph of the lesion. He is alive 3 years postoperatively. These, as you see, are varied lesions of the ureter. I believe the micropathology furnishes a fairly reliable basis for diagnosis and prognosis in these lesions.

DR. VINCENT J. O'CONOR (Chicago, Ill.): Before this group, 2 years ago, along with papillary tumors of the renal pelvis, I reported 11 cases of primary carcinoma of the ureter. Since that time, we have seen 4 additional cases of primary tumor of the ureter, as well as two primary tumors of the ureter that had incomplete operations done elsewhere. Therefore, I believe it is rather timely to emphasize the fact that perhaps we have considered primary tumor of the ureter as being a rare lesion largely because we may have overlooked a great many of them in the past.

I am quite sure that I have overlooked some, because a great many of these patients appear with pyonephrosis, with a ureter that cannot be catheterized, with one that cannot be visualized either by retrograde injection or by excretory urography, and very frequently our therapy is to remove the kidney and leave the ureter.

If these patients do not go on and bleed grossly from the stump of the ureter, very often they die of carcinoma metastases from the ureter itself and the primary tumor goes unrecognized.

Adequate removal of the lower end of the ureter along with the kidney is most important because in most of our patients, the primary tumor has been in the lower end of the ureter.

(Slide) You see here an ordinary infected hydronephrosis with a filling defect in the lower end of the ureter that might well have been missed if the patient had had no gross hematuria. Complete nephro-ureterectomy cured this patient. She went on and lived for 9 years without recurrence, and died of cardiac disease.

(Slide) Here, again, is another relatively small primary lesion of the ureter. This woman had chills, fever, pain in the left loin, all the symptoms of an infected left kidney, and yet, she had a primary papillary tumor of the ureter, as the cause of the pathology. She is living and without evidence of recurrence 7 years after operation.

(Slide) This emphasizes what Dr. Taylor has already emphasized, that is, removal of the specimen in toto.

(Slide) This shows an infiltrating tumor of the lower end of the ureter, with the hydronephrosis above.

(Slide) Here is a very small infiltrating tumor of the lower end of the ureter, with hydronephrosis above.

(Slide) This is the same patient, showing how localized that lesion was.

(Slide) Here is a recurrent case in which a large pyonephrosis was removed. I suspected from some very unsatisfactory ureterograms that this patient might have pathological changes in the ureter. We built her up and went in and removed the ureter, and you see this very marked infiltration of the ureter itself due to squamous celled carcinoma.

(Slide) Here is the tumor of the lower end of the ureter, with hydronephrotic shell. This patient is well 14 years after operation.

(Slide) The same thing—a tumor of the lower ureter, with complete destruction of the kidney above. This patient is well 11 years after operation.

(Slide) The same thing—tumor of the lower end of the ureter, with complete hydronephrosis above. All of these patients present themselves, except for the occasional hematuria, with a picture of upper urinary tract infection.

(Slide) This is just a small filling defect in the right side.

(Slide) You can see here the extensive tumor of the one ureter, the double ureter going through.

The point that I should like to make is that in our experience, tumors of the ureter run absolutely parallel with primary tumors of the renal pelvis; in other words, the papillary tumors are readily curable. After complete extirpation of the urinary tree, we have patients living as long as 14 years. The squamous cell tumors, in our experience with 6 of them, have all died. They died just as our squamous cell tumors of the renal pelvis die, even though we get them at what appears to be a fairly early stage and do a wide extirpation, including the intramural portion of the ureter. As Dr. Baker has just said, I believe the type of tumor, in addition to the completeness of the surgery, will determine the survival rate.

Dr. John K. Ormond (Birmingham, Mich.): I would like to ask a question of Dr. Leadbetter, as I am not sure that I understood him.

In performing that operation, particularly on the left side, did I understand that you bring the ureter up over the bowel and then anchor the bowel with the flap of mesentery? Do you find it desirable to implant that ureter along the course of the longitudinal muscle or can it be done in any other part of the bowel?

Dr. Clyde L. Deming (New Haven, Conn.): I am particularly interested in Dr. Ferris's contribution. Recently, we had a postoperative case that presented all the symptoms which Dr. Ferris has described, representing acidosis.

We found that this man had residual urine in the rectum of 800 cc. A retention rectal tube corrected the condition of the electrolytic imbalance.

The question which I would like to ask Dr. Ferris is, does he have any idea as to how soon the patients will adjust their electrolytic balance with their alkali treatment. Will they adjust themselves suddenly or will it take several weeks after treatment?

Dr. Louis Orr, Jr. (Orlando, Fla.): I would like to ask a question of Dr.

Ferris. Considering the rapid conversion time of bicarbonate in these patients who show the obvious evidences of hyperchloremia, were there any clinical symptoms of alkalosis? These dosages appear to be rather large.

Also, did he use any sodium lactate either intravenously or by mouth in treating this particular patient with hyperchloremia and acidosis? Sodium lactate can be used by mouth.

Another question I would like to ask is about the sodium ion. Was there any increase if he did use sodium lactate? I noticed that the sodium ion was perfectly constant in the slide.

DR. FLETCHER H. COLBY (Boston, Mass.): A year ago, Dr. Kerr and I reported our experiences in cystectomy for cancer of the bladder with pelvic lymphadenectomy. I want to take this opportunity to tell you of our further experiences with this operation as regards transplantation of the ureter.

It is a great temptation, at the end of a 4- to 6-hour operation, where the bladder is removed and a radical resection of the pelvic lymph nodes performed, to do the very simplest type of anastomosis of the ureter to the sigmoid. At that time, we said that as far as we could determine, a simple stab-wound anastomosis had worked as well in our hands as any other type of anastomosis.

I want to take this opportunity to say that further experience with this has thrown considerable doubt on whether that is a good procedure. Within the past year, where we have used this simple technique, we have had two strictures of the ureter where it enters the bowel. To me, it is entirely comparable with the hit-or-miss results that we have when skin ureterostomy is done; that is, where the ureter is allowed to hang out of the skin. You may have a good junction between the ureter and the skin, but you will at times have a stricture at that point, and I think the same thing applies where the ureter is put through the bowel and no direct anastomosis is done between the mucous membrane of the two structures. Therefore, I certainly can no longer advocate this tempting simple operation.

DR. J. DELLINGER BARNEY (Boston, Mass.): I would like to ask Dr. Davis two questions. First, how far out from the electrode does this wire protrude? Second, he tells us to push the wire as far as it will go. How can one be sure that it does not push itself through the wall of the ureter? In any event it is an efficient-looking and ingenious idea.

DR. ROGER C. GRAVES (Boston, Mass.): I wonder if we might increase the cure rate in some of these very malignant carcinomas of the lower end of the ureter if we dissected the iliac and obturator lymph nodes on the involved side at the time of operation.

I think we should all acknowledge our debt to Dr. McCarthy for his many contributions. He has been too modest in assigning all the credit to the manufacturers.

I would like to congratulate Dr. Leadbetter on his paper. He has a new method which seems to work very well. I am not sure that it will always prevent stenosis at the point of anastomosis, because narrowing may still occur within the tunnel from fibrosis, but it is worth trying, and certainly his initial results have been very good.

I would like to congratulate especially Dr. Ferris and his associates. I am sure that we should have more studies in basic physiology with reference to this problem of ureteral transplantation to the large bowel. There are many factors involved as has been said. I would like to ask Dr. Ferris what the anatomical situation was in the case that he reported so fully from the laboratory point of view. Did that young man have or did he not have upper urinary tract dilatation as a result of his transplantations?

Dr. Charles C. Higgins (Cleveland, Ohio): I would also like to congratulate Dr. McCarthy on the excellent contributions he has made in the advancement of our various surgical procedures.

As many of you, I am a staunch supporter of the submucous method of implantation. I base this primarily on one or two observations. First, I believe that we should adopt an operative procedure in our clinical patients that simulates as closely as possible the identical condition in lower forms of life. If a cross section is made of the cloaca of a bird, any type of bird, an ostrich, you will find that it is identical with the Coffey technique of implantation.

Second, it also simulates very closely the method by which the ureter opens into the bladder. When Coffey advocated the submucous principle, he stated it was utilized for three reasons: First, a valvular mechanism was produced; second, it was an ideal method of preventing peritonitis, as the ureter is sealed off in the trough of the bowel in the period of 6 hours; and, third and very important, I believe, is that the peristaltic wave, in passing down the bowel, exerts a milking action on the ureter itself.

Now, a valvular mechanism is not produced, that is, a true valvular mechanism, which we showed in the laboratory years ago. You can ligate the anus of a dog for a period of 5 or 6 days and at the same time you do not get reflux of gas up to the kidney. Well, the reason, of course, that this is true is not because a valvular mechanism is established, but the gas in the bowel obeys the laws of expansion of gases, which is expansion in all directions. Therefore, the gas content in the bowel increases, it presses on the mucosa of the bowel and temporarily occludes the ureter.

I believe, likewise, that Dr. Ferris is to be congratulated on his excellent piece of work. I think that many of us overlook a great deal of the research that has been done by excellent physiologists on the absorption of urea, chlorides, and glucose, from the bowel and various portions of the bowel. It has been very definitely shown that urea, chlorides, and glucose are reabsorbed in the bowel, but that even in the small intestine, creatinine, creatine, and amino acids are not absorbed.

I believe that when we consider the results following transplantation of ureters in the bowel, we introduce another possible error; that is, regardless of the picture conveyed by the excretory urogram, there may be some impairment of renal function. This has been eliminated by an excellent piece of research which you will hear next week, in which the bladder was anastomosed to the various parts of the bowel and reabsorption studies made.* I would strongly recommend that you hear the lecture at the American Urological Association.

* Boyce, W. H.: J. Urol., **65**: 241, 1951.

DR. EDWARD W. CAMPBELL (Philadelphia, Pa.): Annular ureteral tumors, in our experience, are usually the result of cellular infiltration of the ureteral wall about its entire circumference. I should like to present an example of an annular growth without evidence of extension by infiltration.

The patient was a white man aged 62, who was admitted to the surgical service because of a large mass in the left side of the abdomen. He had had no other symptoms.

An excretory urogram revealed a nonfunctioning left kidney.

Ureteral catheters were obstructed in the pelvic ureter, beyond which obstruction no dye would penetrate. The ureteral obstruction appeared as an irregular filling defect in a greatly dilated ureter, as shown in the lantern slide, which was indicative of a tumor.

The gross specimen after incision of the ureter revealed an annular growth growing from the mucosal surface of the ureter in a ring-like fashion with a central orifice through which a probe could be passed. The growth was easily dissected away from the submucosa by lifting the mucosa and the attached growth.

Tissue sections suggested transitional type of carcinoma, grade 2.

DR. LEON HERMAN (Philadelphia, Pa.): We have recently had two experiences with ureteral surgery that, to me at least, were unique.

There is a growing tendency now, it seems, on the part of gynecologists to resurrect the old Wertheim operation, and one of our very good men did a Wertheim on a young woman for an early cervical cancer, and apparently both ureters sloughed out. Eight days later, he did a cul-de-sac incision and eliminated a lot of pus and urine, so several weeks later we went in and tried to do an intestinal anastomosis. The ureters were destroyed so far up that it was a technical impossibility. We had to do a high ureterocutaneous anastomosis.

The second case was that of a girl born with a unilateral kidney, with Hunner's ulcers. We had been treating her for some 10 or 15 years, and she finally got so miserable that she asked us to do something radical so we did a Coffey 1 technique implantation, with apparently complete success for a time and then she became obstructed, so we went in transperitoneally and opened the ureter and dilated it widely, and again she was quite all right for a time, and then again it became obstructed. Then we did an end-to-side uretero-intestinal anastomosis through a loin incision, extraperitoneally, and now the girl is quite well. That was 6 months ago.

I have had the conviction for a long time that ureteral meatotomy is a serious operation. We have had some pretty bad experiences with it. I do not believe it is indicated except in ureterocele, with the exception, perhaps, of an occasional very rigid stricture that you cannot dilate.

In ureterocele, of course, the walls are composed of the mucosa of the bladder and ureter, and you don't cut the sphincter, so it doesn't have any physiological effect. But if you cut a normal meatus, you get reflux, and these patients are due for pain in the back every time they void. If they do get reflux, and they very often do, I think, they usually have infection of the kidney on that side.

Dr. Davis' technique is ingenious, but I think in his conclusion he probably should have stated his indications for the procedure.

Dr. Meredith Campbell (New York, N. Y.): In discussion of Doctor Davis' paper, I brought along this miniature ureteral meatome, which is a new type that the American Cystoscope Makers, Inc. made for me this past year. One of its virtues is a small (3F) flexible woven filiform at the tip which keeps the scissors in the proper position so one can cut the ureteral orifice and further upward if desired. My experience with meatotomy, especially in the young, has not been that which Dr. Herman just indicated.

Dr. John A. Taylor (Closing): I read Dr. Ferris' article in the *Journal* of the AMA at a time when we were having trouble with acidosis and azotemia in transplants, which technically and anatomically seemed all right. I think he proved, with the use of the rectal tube, that it was due to the absorption of chlorides across the rectal mucosa.

It seems to me that if 80 per cent of these cases get acidosis, it is going to be a deterrent to transplants, and I wonder how we are going to avoid it. One does not get it when the ureters are brought out to the skin.

Recently, I had occasion to transplant the ureters in a Brunschwig operation, where the whole pelvis was cleaned out, and the sigmoid was brought out in left lower quadrant. The patient, a girl who made a very remarkable recovery, had a terminal colostomy. Now, she has trouble with her hygiene, but she has no acidosis or azotemia because she does not retain her urine long enough for absorption. I wonder if somebody with Dr. Ferris' ability and opportunity could not work out some way to get around the absorption of chlorides. I think it is a very serious complication.

I have been using Dr. Davis' meatotomy with success, and we use it mostly in stones that are impacted in the lower ureter; that is, at the meatus. We have followed these cases and they seem to heal very well without reflux.

With regard to my own paper, surely it was a very modest contribution compared to the discussers' contributions. I said that if some of these hypothetical questions could be answered, we might understand more about carcinoma of the ureter. I am going to change that and say that if somebody could find out why they have so many carcinomas of the ureter in Chicago, perhaps we would get some place.

Dr. Joseph F. McCarthy (New York, N. Y.): I overlooked two important things in my paper, and if I may have the indulgence of the Chair for a moment, I will mention them here. I think there are altogether too many total cystectomies, and by the same token, too many endoscopic approaches to bladder tumors. We hear more about technique and less about late end results. A case in point will indicate what I mean.

We have two obligations: one, to cure the patient, and the other, to alleviate the condition. They are equally obligatory. This patient had 6 papillary adenocarcinomas, 2 on the trigone, the other 4 scattered about the rubber ball part of the bladder. I suggested cystectomy to this man, who was about 60-odd, and at the same time told him that there was another method whereby the possibility of cure was more remote, but we might be able to carry him on for a number of years. He refused the cystectomy and accepted the other operation.

Now, there are certain parts of the bladder where you cannot do an adequate job with endoscopic electrocoagulation or excision without danger of pelvic cellulitis. I had one death from it. The following method is reasonably safe: First mobilize the bladder as though you were going to do a complete cystectomy. Pack underneath the bladder a big pad of gauze. Then one can do almost anything with the bladder proper.

In this case, we excised with the usual hard-rubber cutting electrodes with remote control, with two buttons on them, one for cutting, the other for coagulation and we excavated the growths on the trigone down to the muscularis, after which we electrocoagulated that whole area in a manner impossible with endoscopic methods. The other growths were excised.

That was 3 years ago. Today, the patient is microscopically, cystoscopically, and symptomatically free of evidence of growth. In my opinion therefore, there is an intermediate method that we should not overlook. Avoid fads in urology, and there are many of them. Each year, we have new ones.

I forgot also to mention the matter of concepts of the future. In certain cases of giant stones in the kidney, it seems to me that with the use of polyethylene catheters which do not accumulate crystals and which can be left in for a long time, if, at the time of operation, some of those stones are taken, and really quantitatively estimated, and then an appropriate solution biochemically, also estimated, that will not damage the kidney structure. With the use of nephrostomy tubes, with these polyethylene catheters, with or without manometric pressure over a long period of time, it takes the load off the kidney. The concept is that one may convert an otherwise inoperable case into a potentially operable one.

In such an arrangement, and this is all theory, with two of these catheters, one of them should have a prolongation down the ureter to prevent fragments from getting into the ureter. Nephrostomy, in my opinion, is one of the most beneficent of surgical procedures in urology. I learned that from von Lichtenberg years ago. He did a nephrostomy in practically every stone case. I have followed this practice.

If one does a nephrostomy, leave the tube in for 13 days, as Pedroso of Havana showed me years ago, putting heavy silk sutures through all the muscular structures, you will never get a hernia.

Dr. Deward O. Ferris (Closing): Dr. Fish asked if this occurred as commonly in infants as in adults. I believe it does. However, children do not manifest the clinical symptoms as readily as adults. A wider deviation from normal is required before the clinical picture of acidosis is apparent.

Dr. Deming's first question results from a misunderstanding. We feel very definitely that these patients should not retain urine in the bowel for long periods of time. Our primary direction to patients after a ureterosigmoid operation is not to retain urine in the rectum.

They should void every 3 or 4 hours and try to keep from having a pool of urine in the rectum or in the rectosigmoid.

These patients adjust very quickly once the proper treatment is instituted.

This case we have reported shows the complete cycle. The hyperchloremia develops first, followed in a few days by acidosis, and in the return to normal the acidosis disappears first, followed in a day or two by disappearance of the hyperchloremia. The acidosis will disappear in 2 or 3 days while the hyperchloremia will disappear in 6 to 7 days.

Dr. Orr asked regarding other alkalinizing substances. We have tried many of them and have considerable data. The evaluation of them is rather difficult, but I do think that the calcium ion is the one that should be used in these cases. The answer to Dr. Taylor's question, too, is that the substitution of calcium carbonate for sodium bicarbonate is probably the best choice.

Dr. Wyland F. Leadbetter (Closing): I would like to say a word about ureteral tumors and tumors of the renal pelves, particularly with regard to epidermoid cancer, because it seems to me that results from the surgical treatment of epidermoid cancer of the ureter and renal pelves have been extremely poor.

Probably the reason for this is that lymphatics are very early involved in such cases, in contradistinction to the papillary tumors of the renal pelvis and ureter which are involved relatively late or not at all, even in the case of extensive lesions.

To my mind, the possibility of better results and even cure in some cases is dependent upon the performance of a fairly extensive retroperitoneal gland dissection as well as nephroureterectomy. It would seem to me that if we are going to improve our results in this type of cancer, we should make an effort to learn to do, and to do retroperitoneal gland dissection in early cases of epidermoid cancer of the ureter and renal pelvis. I see no way of improving the results at all unless something additional in the way of surgical treatment is done.

In reference to Dr. Ormond's question about the operation which I discussed, we bring the left ureter through the mesentery of the sigmoid so that the implantation is done through the taenia on the anterior surface of the bowel. I am sorry that I did not make that clear.

I wish to thank the other discussers.

Dr. David M. Davis (Closing): In reply to Dr. Barney's question, the wire is inserted into the ureter with the instrument in such a position that it runs directly along the axis of the ureteral lumen, and the delicate touch perception of the urologist will tell him whether or not the wall is being penetrated. It is only after the wire is in to its full length that the outer end of the instrument is depressed; therefore, there should be no trouble about penetrating the wall of the ureter.

It would seem to me that a length of cut of 6 to 8 millimeters is usually quite safe in an adult. If that is inadequate, the procedure can be repeated at a later date.

As to Dr. Herman's discussion, I purposely omitted from the paper any consideration as to the indications for ureterotomy. It was not a discussion of the procedure but merely a presentation of a method. I must therefore leave it to my readers to make their own decision as to when meatotomy is necessary.

CUTANEOUS METASTASIS FROM CARCINOMA OF BLADDER

HOMER G. HAMER AND (by invitation) MYRON H. NOURSE

The recent finding of a subcutaneous nodule lying in the abdominal wall of a patient with carcinoma of the bladder which microscopically proved to be a metastatic lesion from the bladder, prompted a survey of the literature for similar instances. Eleven cases have so far been reported. The actual incidence is probably considerably greater than this would lead one to believe. Evidence, however, is lacking. Kretschmer seems to have demonstrated the first positive evidence of skin metastasis of one case in 1922. Rolnick and O'Neill in 1932 described skin metastasis from carcinoma of the bladder in a 48-year-old man. Atkinson in 1942 reported a case which developed a metastatic nodule on his upper lip while a patient in the hospital. He also mentions 3 other cases that are referred to by Willis, each from a rare or anaplastic form of cancer of the bladder. Nine hundred two epithelial tumors of the urinary bladder were registered with the American Urological Association in 1934. Two cases were listed with skin metastasis. Liljencrantz, in the Cancer Handbook of the Stanford University Press, states that of 1000 patients dead of carcinomas and autopsied at the Stanford University Hospital, 36 primary bladder carcinomas were found. Only one was found to have skin metastasis. Higgins and Hausfeld report 2 additional cases and make a plea for report of such cases for future evaluation of treatment of carcinoma of the bladder. Our case represents the twelfth reported.

CASE REPORT

E. F. H., a white man aged 71 years, was first seen in the office April 9, 1949, with the chief complaints of frequency and urgent, painful urination, interval urinations every 5 minutes day and night. His urine was grossly bloody. He had a net weight loss of 40 pounds in 3 months. Rectal examination revealed an essentially normal prostate with a grade I hypertrophy. Blood pressure was 120/65.

He was admitted to the hospital for further studies and palliative relief. Cystoscopy under spinal anesthesia showed a bladder capacity of less than 2 ounces, with an extensive infiltrating carcinoma of the bladder. Excretory urograms demon trated a moderate left hydronephrosis with hydro-ureter and a nonfunctioning right kidney. These films did not demonstrate bony metastasis. Biopsy of the bladder wall at the time of cystoscopy showed a grade 3 undifferentiated infiltrating carcinoma of the bladder. Following supportive therapy for severe hypoproteinemia and severe secondary anemia, the patient was prepared for urinary diversion. On May 10, 1949, cutaneous ureterostomies were performed through bilateral McBurney type muscle-splitting incisions. Just lateral to the line of the left skin incision and in the subcutaneous tissue was a nodule measuring 1.5 by 1.3 by 0.7 cm. which was removed for microscopic study. This proved to be metastatic carcinoma from the bladder (fig. 1). The postoperative course was relatively smooth and the patient demonstrated remarkable symptomatic relief. He improved so much that cystectomy seemed justi-

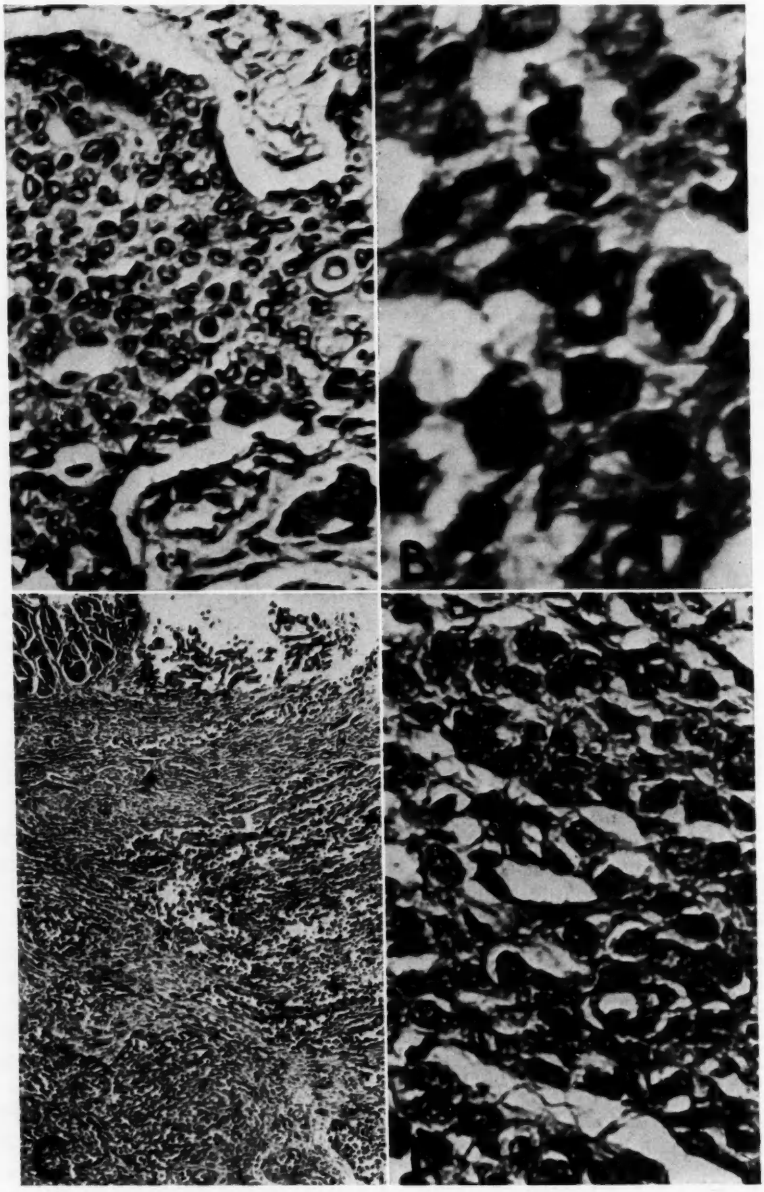

FIG. 1. *C*, low power section demonstrating infiltration of tumor tissue in subcutaneous layer with both normal and ulcerated epithelium alone. *A*, *B* and *D*, higher magnifications of areas of tumor cells.

fied. This was performed June 30, 1949. Sections of the removed specimen showed invasion of the prostate and seminal vesicles. His immediate postoperative course was considered to be normal, but 4 weeks later he began to go downhill and he died September 8, 1949, five months from the date of his first visit. Autopsy was not obtained.

CONCLUSIONS

A case report is presented which demonstrated a cutaneous metastasis on the anterior abdominal wall originating from a carcinoma of the urinary bladder.

This metastasis could not have been precipitated by surgery as no srugery had been performed prior to its removal.

It is believed that this finding is not so rare as a review of the literature indicates, but evidence is lacking. This represents the twelfth case reported.

The early demise of our patient emphasizes previous observations that once cutaneous metastasis from carcinoma has occurred, the prognosis is hopeless and death may be predicted in 4 to 6 months.

1711 N. Capitol Ave., Indianapolis, Ind.

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SALPINGOVAGINAL FISTULA: REPORT OF CASE

GERSHOM J. THOMPSON

Section on Urology

AND

VIRGIL S. COUNSELLER

Division of Surgery, Mayo Clinic, Rochester, Minn.

Profuse drainage from the vagina which follows hysterectomy is usually due to vesicovaginal or ureterovaginal fistula, occurring as a result of accidental injury to the bladder or to one or both ureters. The resulting escape of urine may be total in the case of vesicovaginal fistula so that no urine collects in the bladder and the patient is never able to urinate in a normal manner. If the injury is to only one ureter the escape of urine is usually constant but the patient voids urine at regular intervals from the intact bladder providing the opposite kidney is present.

Recently we have seen a patient who presented a very interesting problem of profuse constant drainage from the vagina which did not result from injury of either the ureters or the bladder.

CASE REPORT

A white married woman, aged 53 years, admitted October 25, 1949, stated that she had undergone vaginal hysterectomy August 17, 1949, elsewhere. The uterus was said to contain multiple fibroids. Three days postoperatively she began to dribble fluid from the vagina, presumably urine, and this continued in spite of numerous catheterizations of the left ureter, which was thought to be the site of injury which had occurred during the operation. The surgeon made a diagnosis of injury to the left ureter because he found it difficult to introduce a catheter into the ureter. Pyelograms did not demonstrate a fistula. In spite of the use of an inlying catheter in the ureter for the greater part of two months, the drainage continued.

Examination showed a rather apprehensive and somewhat hypersensitive individual, but no physical abnormality could be demonstrated other than profuse, watery vaginal discharge. An excretory urogram showed both kidneys functioning normally and there was no evidence of dilatation of the calyces, pelves or ureters. Cystoscopic examination with the patient under anesthesia revealed a normal bladder; a catheter could be passed up the left ureter without the slightest difficulty. Vaginal examination with a speculum disclosed a small opening high in the left vault from which watery fluid drained. A catheter could be passed into this, with some difficulty, for approximately 3 cm. The catheter in the ureter and the one in the opening in the vaginal vault were injected with medium; they apparently demonstrated a sinus lying adjacent to the ureter, but no clear-cut communication with the ureter could be seen (fig. 1,*A*). A tentative diagnosis of ureterovaginal fistula was made but since there seemed to be some hope of spontaneous closure, surgical treatment was postponed.

The patient was dismissed on October 29, 1949, with instructions to report to her home physician for a number of weeks' observation.

She returned to the clinic on December 29, 1949, stating that the dribbling had continued unchanged. The normal size of the ureter as seen by excretory urography seemed to exclude the presence of a ureterovaginal fistula because in our experience, increase in the caliber of the ureter above the site of a fistula is always found. Further study was made the next day. The bladder was again examined very carefully and there was no sign of a vesicovaginal fistula. A large catheter could be passed up the left ureter without the slightest difficulty. The

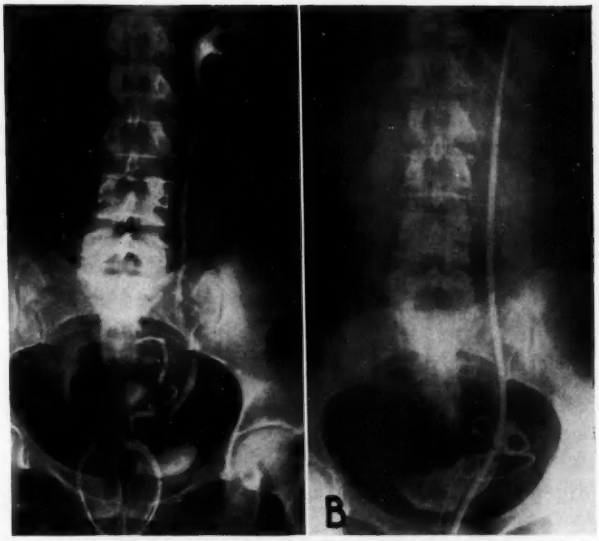

FIG. 1. *A*, left retrograde pyelogram showing normal-sized ureter. Catheter in sinus tract, also injected, shows extravasated medium adjacent to ureter but not communicating with it. *B*, large catheter is in the ureter. A small catheter is coiled in left side of cul-de-sac. Medium which has been injected outlines typical bowel pattern.

vagina was then examined with a speculum and the minute opening in the left vault was still present and from it watery fluid was observed to drain. A small ureteral catheter was passed into the opening and no obstruction was encountered, so approximately 20 cm. of the catheter was passed into it. The bladder was then filled with water colored with indigo carmine; none of this appeared in the vagina, nor did it drain from the catheter. A roentgenogram was then made after injecting opaque medium into the small ureteral catheter (fig. 1,*B*). This demonstrated a collection of medium in the cul-de-sac and outlined the irregular spaces between the loops of bowel which were lying in the cul-de-sac. The diagnosis of left salpingovaginal fistula was made. We believed that the profuse drainage of watery fluid was peritoneal fluid which escaped through the patent fallopian tube.

Operation was performed on January 4, 1950. When the abdomen was opened the No. 4 ureteral catheter could be seen coming into the peritoneal cavity,

through the fimbriated end of the fallopian tube (fig. 2). This tube, ovary and sigmoid were all matted together. The sigmoid was separated from the mass, and the ovarian pedicle and left tube were removed close to the vaginal wall. The area was peritonized. The cul-de-sac was otherwise normal. The abdomen was closed with chromic catgut sutures.

The patient's convalescence was uneventful. At the time of dismissal there was a minimal amount of vaginal discharge. A letter received recently stated that she is still troubled at times with urgency of urination which on occasions is so marked that she wears a vaginal pad, but she also informed us that the leakage is much less than she noted preoperatively. She has been advised to return for further examination but up to this time has not complied.

FIG. 2. At time of operation, catheter was seen coming into peritoneal cavity through fimbriated end of fallopian tube.

COMMENT

Prolapse of the fallopian tube has been reported by a number of authors, according to McElin and Ferris who reported 2 cases of their own and also referred to 10 others which had been reported in the literature. This condition, however, is unlike that encountered in our case because very profuse drainage persisting over a period of months was not described as occurring commonly with prolapse of the tube. Rather the fimbriated end of the tube was responsible for vaginal bleeding and bloody discharge. The unusual appearance was suggestive of neoplasm in some cases.

The lack of ureterectasis which is always seen when ureteral injury has occurred and has resulted in fistula formation, was the diagnostic point which led us to study this condition further and enabled us to arrive at the proper diagnosis.

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DISCUSSION

DR. HERMAN L. KRETSCHMER (Chicago, Ill.): Several years ago Dr. Charles Higgins made a strong plea that all cases of skin metastases occurring in patients with carcinoma of the bladder should be reported. In this way literature on this very interesting subject would be built up and would give us some information on the frequency with which skin metastases occurs in this group of patients.

Recently Dr. McDonald, Dr. Heckel, and I reported 2 cases that were published in the *Archives of Dermatology and Syphilology*.* One of the patients was a male who had a papillary carcinoma of the bladder with extensive skin metastases that involved the skin from his head to his feet. He had had several fulguration treatments, as well as an open operation upon his bladder. The second patient was seen by Dr. Heckel, and was not operated upon, so that operation or fulguration plays no role in producing skin metastases.

It may be that if we all report our cases, it will not be very long before a good comprehensive literature would be built up. It may be as it now is with tumors of the ureter, that skin metastases that occur in cases of carcinoma of the bladder are not as rare as we believe.

I wish to compliment Dr. Hamer on a very interesting case.

DR. BEN D. MASSEY (Pasadena, Calif.): I would like to discuss Dr. Hamer's paper by implementing it with a case of our own in which we have what we think is an isolated skin transplant.

Some years ago, it was stated rather dogmatically that when a metastatic bladder tumor appeared in the incision, following open operation, it was usually due to direct extension of the bladder tumor along the sinus tract into the wound area.

This patient was a 51-year-old man, who had an infiltrating type of carcinoma on the posterior wall of the bladder. The biopsy was reported as squamous cell carcinoma grade 2. An open type of procedure was done, in which about 34 half-millicurie radon seeds were implanted into the tumor. About 6 weeks after the procedure, a rather indolent-appearing lesion appeared in the upper angle of the wound, well away from the old sinus tract and cystoscopic examination revealed no evidence of tumor in the dome of the bladder. This lesion progressed rather rapidly. A biopsy was taken, and it was found to be the same type of carcinoma which was present in the bladder.

The tumor was widely excised, including the full thickness of the abdominal wall; and at the lower end of the old incision the bladder was opened at the site of the previous cystostomy. A rim of tissue was taken from the bladder at this point, examined separately and found to be free of tumor. The gross and microscopic examination of the tissue revealed that his implant was about 6 cm. in diameter, was in the subcutaneous tissue above the fascia, and did not involve the deep layers of the abdominal wall.

I have two slides that I would like to show you.

(Slide) The first shows the carcinoma of the bladder.

* Arch. Dermat. & Syphil., **61**: 276–284, 1950.

(Slide) The second shows the implant within the subcutaneous tissue. The slides show a striking similarity as to form and cellular content.

It is to be noted it is of a much higher degree of malignancy than the pathological report indicates.

Dr. Thomas E. Gibson (San Francisco, Calif.): I would like to add an observation to that of Dr. Massey. Apparently, cutaneous metastases must be rare. I recall seeing only one, which I would like to report briefly.

This was a woman, 40 years of age, whom I had been following for about 2 years, with Hunner's ulcers, giving her the usual treatment of periodic hydraulic distention of the bladder under spinal anesthesia and fulguration. Eventually, I noticed that a growth was developing on the side of the Hunner's ulcers, and by biopsy proved it to be a papillary carcinoma. This is the second time I have seen carcinoma develop at the site of Hunner's ulcer. The other case was that of a man, strangely enough.

This papillary tumor did not respond well at all to endoscopic methods, so I performed a total cystectomy and bilateral uretero-intestinal implantation at one sitting. She got along fine for a year and a half, and then she began to show multiple skin nodules. Her whole body broke out with these small nodules, about 1 cm. in diameter, raised well above the surface. At a distance, it appeared like a case of von Recklinghausen's disease. Biopsy proved these nodules to be identical with the growth in the bladder. Coincidentally, her lungs began to fill up with metastases, and she died very shortly thereafter.

Dr. Joseph F. McCarthy (New York, N. Y.): I would like to report a case following suprapubic prostatectomy which had some induration. At the time I had him under suspicion of potential malignancy, but repeated histological studies failed to reveal any evidence of cancer. The patient went on after two months following closure, the sinus reopened, and revealed some vegetative outcroppings at the outlet of the sinus. We excised some of it and found it to be malignant.

Presumably we must have missed a small papillary growth somewhere in the bladder, because after two or three years, with a nephrostomy tube, a month or so ago, we found a papillary growth on trans-sinus study with the endoscope. Therefore, some of these cases may well have incipient buds in the bladder that are overlooked.

Dr. George W. Fish (New York, N. Y.): I would like to take this opportunity to add two more cases of metastasis to the skin from bladder carcinoma to those reported by Dr. Hamer.

The first was a man of 54 who 10 years ago underwent a partial resection of the bladder for carcinoma in the region of the left ureteral orifice. He remained without symptoms for 2 years and then developed painful nodules in the suprapubic region. Biopsy showed them to be metastatic. Examination of the bladder at this time was negative. Because of the severe pain which they caused him the nodules, some of which were as large as a golf ball, were excised. His convalescence was uneventful. He survived 4 years following the excision of these metastatic nodules and then died of general carcinomatosis. There was no recur-

rence of the tumor in his bladder when he was last cystoscoped, which was 4 months before his death.

The second case was that of a man of 71 who had a large carcinoma involving most of the base of his bladder. Through a suprapubic incision, radium needles were implanted in the tumor. The response to the radium was far better than we had anticipated. However, a year later large painful nodules developed in the suprapubic region. Biopsy showed them to be metastatic. They were excised and following the excision the patient was given deep x-ray therapy. There has been no further recurrence of the nodules. The bladder was cystoscopically negative 6 months ago and the man feels well and has no symptoms at the present time.

RELATIONSHIP OF STEROIDS TO SOME PROBLEMS IN PROSTATIC CANCER AND TO MEDICINE IN GENERAL

WILLIAM P. HERBST

One of the earliest types of endocrine therapy was the use of virgins' urine as a medicinal agent. In 1893, castration was inaugurated for prostatic hypertrophy in the male and for malignancy of the breast in the female. In 1941, administration of estradiol diproprionate was reported by me and castration by Huggins in the treatment of prostatic cancer. Huggins also demonstrated that androgen stimulated and estrogen inhibited prostatic epithelial cells either benign or malignant.

CLINICAL OBSERVATIONS

For mental depression, estrogen or androgen has been used for both sexes.

Vasomotor instability in either sex due to gonadal insufficiency has been fairly well controlled by the administration of either estrogen or androgen.

Testosterone has been used as a morale builder for patients who face either single or multiple surgical procedures and do not seem to have the nerve to be operated upon.

Psychogenic amenorrhea, as reported by Reifenstein, has been found to be accompanied by a decrease in the urinary excretion of the 17-ketosteroids.

British surgeons observed a steroid insufficiency insofar as impotence was concerned. They found that patients on whom they were going to do prefrontal lobotomies had practically zero 17-ketosteroids and were impotent. After they had the prefrontal lobotomy, the patients became potent and the ketosteroids returned to normal again.

Stress and lack of oxygen produced hyperadrenal secretion of cortisone or compound E through the effect of hypothalmas.

The phenomenon of fainting is an inhibition of the secretion of the adrenals.

The instances of success in producing pregnancy by couples who have adopted children are strongly suggestive of a change in the steroid balances.

The observation that many individuals who are producing oxalate gravel do not produce these gravel when they are living under conditions without stress, whereas when they are living under stress they continue to form these oxalate gravel, is indicative of changes in steroid balance.

All of the above observations present enough correlation between psychic influences to make the name "psychosomatic medicine" obsolete and definitely unscientific. Instead of psychosomatic medicine, "psychochemical medicine" would be much more appropriate.

FURTHER OBSERVATIONS ON THE CLINICAL RESPONSE TO CERTAIN OF THE STEROIDS

Testosterone has been observed to favorably modify the cardiac muscle metabolism and to result in the relief of certain arrythmias. In some instances

people who are definitely victims of senile dementia can be brought back in satisfactory contact with their environment upon the administration of testosterone.

Unfreshened cows can be made to yield milk when given stilbestrol.

Testosterone favorably influences breast carcinoma in the female.

Old race horses have been rejuvenated and made winners by the administration of testosterone.

Diabetes is favorably influenced by estrogen or castration.

Patients who suffer from rheumatoid arthritis are spectacularly relieved and we see tissue changes reversed in them which were previously considered irreversible following the administration of cortisone or ACTH.

In the field of acute bacterial infectious and inflammatory lessions we see almost instant relief of fever and inflammation following the administration of cortisone or ACTH.

CHEMISTRY

The testis excretes nine steroids. The ovary excretes four, the placenta three and the adrenal not less than twenty-eight, one of which is cortisone. Forty-six steroids have been identified in the urine. Dobriner has made numerous pattern analyses of a moderate number of the steroids excreted in the urine of normal people and in patients who are suffering from different malignant and nonmalignant clinical entities to determine if such patterns could be of value in diagnosing these entities. To date he has observed that the amount of etiocholanolone is strongly suggestive of malignancy.

It has been observed that small doses of testosterone cause atrophy of seminiferous epithelium, whereas large doses protect spermatogenic elements against atrophy.

The effect of testosterone, estradiol and progesterone on vaginal cornification, seminal vesicle growth and progestation provides a pattern which insofar as specificity of action is concerned is most interesting.

Epinephrine, stress and lack of oxygen produce hypothalmic stimulation of the anterior pituitary which produces ACTH which in turn stimulates the adrenal to produce cortisone, and results in a decrease in the eosinophile count.

Block and Rittenberg have demonstrated that acetates arise from oxidation of fatty acids and cholesterol by labeling carbon atoms. This observation opens up a metabolic mechanism which may be related to oxalate stone formation in that the organic acid series involving the acetates, citrates, oxalates, malates, etc., are intimately related.

Along this same line it is significant that estrogens produce an increase in citrate urinary excretion or secretion as the case may be.

The study of urinary steroid pattern analysis, while very interesting, involves the functional state of the kidney and therefore is subject to certain inaccuracies. The blood pattern analysis would be much more dependable, but even blood analyses leave much to be desired insofar as our ability to determine accurate specificity of action on different tissue cells.

The studies on tissue culture offers a much better controlled type of observation, but obviously this type of observation cannot be utilized in most of our clinical problems.

In conclusion, steroid chemistry which was given such an impetus by our observations and experience with estrogen therapy and castration in the treatment of prostatic carcinoma, has now spectacularly influenced numerous other medical fields and gives promise of further valuable therapeutic applications.

1801 Eye St., N.W., Washington 6, D. C.

PRELIMINARY REPORT ON THE CLINICAL USE OF TACE (CHLOROTRIANISENE) IN TREATMENT OF PROSTATIC CARCINOMA

PARKE G. SMITH, T. W. RUSH AND ARTHUR T. EVANS

From the Division of Urology of the Department of Surgery, Cincinnati General Hospital and the University of Cincinnati College of Medicine, Cincinnati, O.

At the beginning of the present century orchiectomy was recommended and frequently used as a method of treatment of vesical neck obstruction diagnosed as prostatic hypertrophy. The continued use of this method of treatment for more than a decade was probably due to the beneficial effects obtained in certain cases of carcinoma of the prostate that had been mistakenly thought to be prostatic hypertrophy.

For over 30 years there have been advocates of the use of oophorectomy as a part in the treatment of the carcinoma of the breasts of the female. For many years we have been aware that the presence or absence of gonadal tissue affects the incidence of carcinoma of the breast in standardized carcinoma bearing strains of white mice.

In spite of these and other equally significant sign posts, indicating the channel our thinking should follow, it was only 10 years ago that one of our own members called our attention to the value of hormonal therapy in the treatment of prostatic carcinoma. We, of course, refer to the monumental work of Huggins.

The brilliance of his work forcibly called our attention to the beneficial effect obtained in the treatment of carcinoma of the prostate by the administration of estrogens and, or, the diminution of the androgens following castration. A change in the androgenic-estrogenic balance in favor of the androgenic phase has been interpreted as being the etiological factor producing prostatic carcinoma. The almost immediate and particularly spectacular results obtained by applying the principle of hormonal therapy to those suffering from carcinoma of the prostate so impressed all of us that it very promptly became the method of treatment of this condition that was used by all informed physicians.

As time went on, and we had the opportunity of following these patients, we learned that the spectacular improvement following the initiating of this plan of therapy was at times extremely transitory and only infrequently was it of permanent character. We then began to vary the manner in which we used the agencies of hormonal therapy viz: castration and estrogen administration with the result that although we agree in principle there is a great divergence of opinion as to what plan should be followed in applying that principle in the treatment of carcinoma of the prostate.

Recently, we had the opportunity to ask a number of our friends to inform us about the course of treatment they were using. Although we were aware there was a difference of opinion among us, we had no idea we would receive as many different plans of therapy as replies to our request. Some recommended

The material used in this study was supplied by the Wm. S. Merrill Company, Cincinnati, O., under its trade name "Tace."

the use of orchiectomy as an initial phase of the treatment and others strongly advocated that orchiectomy be reserved for use as a means of last resort. Practically everyone prescribes stilbestrol and there was a general unanimity of opinion that its administration should be more or less continuous throughout the rest of the patient's life, but the variation in the recommended size of the daily dose was really astounding: it varied from 1.5 mg. to 600 mg. per day. Certainly there is no other commonly used principle of therapy whose method of application varies as widely as this.

There is only one conclusion that can be drawn when such a situation is analyzed, and that is, there is no general knowledge of the sequence of events that precede and follow the development of carcinoma of the prostate and the carrying out of hormonal therapy.

We believe that it is time for us to pause and make a real search of our fund of knowledge in the hopes that we recognize certain proven facts or worthy observations that can at this time serve as sign posts needed to guide us in our thinking.

To us there are two facts that we believe do qualify in that respect and should receive serious consideration.

First, most of us are definitely convinced, and we believe correctly so, that at least a contributing factor, if not the real cause of the retrogression of prostatic carcinoma, is hyperactivity of the hormonal phase of adrenal function. Actual hyperplasia of that organ has been reported as an autopsy finding of persons dying as a result of this recrudescence. This fact has been of sufficient importance to some of us to prompt us to attempt to counteract this hyperactivity by such procedures as adrenalectomy, radiation of the adrenal or of the pituitary.

A fact that is of equal importance, especially when considered in conjunction with the preceding observations, is that the continued administration of the estrogens, hexestrol and stilbestrol to laboratory animals, causes enlargement of the adrenal and pituitary. It is possible that estrogenic therapy as prescribed by most of us may be a factor favoring this recrudesence by producing a similar adrenal hyperplasia in man. We might also point out that castration of male rats also causes enlargement of these organs, although only to a minimal degree.

An understanding of this problem of recrudescence of prostatic carcinoma, which of course is of prime importance to all of us, can be approached by obtaining a more complete knowledge of the role played by the adrenal. We believe that an intensive study of the ketosteroids as they occur in patients with carcinoma of the prostate, especially in those receiving hormonal therapy is indicated. Analysis of assay determinations of these ketosteroids, particularly the beta fraction of the 17-ketosteroids, may give us a basis for a more accurate prognosis—may provide us with the means of more scientifically planning a course of hormonal therapy and should be of diagnostic value.

Because adrenal hyperplasia seems to be a matter of importance in those patients in whom recrudescence of prostatic carcinoma occurs, it would appear that we should devise a plan of therapy that would delay this development or lessen or even prevent the likelihood of its occurrence. It is for that reason that

we wish to make a brief preliminary report on our clinical experience in the treatment of carcinoma of the prostate with a new synthetic estrogen, for there are indications that it may serve such a purpose.

About two years ago we were given the opportunity to initiate a program of clinical investigation of the usefulness of the synthetic estrogen, Tace (chlorotrianisene) in the treatment of carcinoma of the prostate. This estrogen, tri p-anisylchloroethylene is chemically similar to diethylstilbestrol and hexestrol in that the three compounds have two phenyl groups separated by two carbon atoms. These carbon atoms are saturated in hexestrol and unsaturated in Tace and diethylstilbestrol. Tace also differs from diethylstilbestrol and hexestrol in that, instead of two hydroxyphenyl groups, it has two methoxyphenyl groups and the two ethyls are replaced by a methoxyphenyl and a chlorine group. See figure 1.

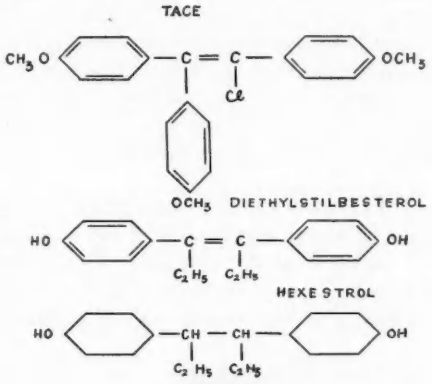

Figure 1

In the beginning of the investigation, we prescribed Tace only to those patients in whom a continuance of diethylstilbestrol therapy seemed inadvisable. It was immediately apparent that the physical evidence (such as gynecomastia and the findings on rectal examination) of the effectiveness of diethylstilbestrol therapy in those patients was easily maintained by Tace and that it did not produce gastric irritability. Prior to our clinical investigation of this synthetic hormone, the research staff of the company interested in Tace carried on an extensive investigative program on laboratory animals. At one of our conferences early in the course of this investigation, they reported that Tace, unlike stilbestrol and hexestrol, produced only minimal enlargement of the adrenal and no enlargement of the pituitary gland in laboratory animals even when given in large dosage over a long period of time. The importance of that fact is immediately apparent and aroused our enthusiasm to continue our clinical investigation on a much wider scope. The findings referred to above have already been reported in a preliminary manner and are the subject of a detailed report, being published elsewhere by the members of that research staff.

We have divided our series of 64 patients into four groups. All of these 64

cases are private patients and consequently we have an adequate follow-up study.

Group 1 is composed of 19 patients, who upon rectal examination showed physical findings of carcinoma of the prostate. Following the administration of Tace, a regression or disappearance of those findings has been noted. Medication is being continued in this group. They have all been greatly improved and those who have been under observation for a sufficient period of time to warrant a deduction have little if any physical evidence of carcinoma of the prostate. Obviously biopsies have not been obtained on this group for they are what might be called early cases.

Group 2 is composed of 21 patients in whom the physical evidence of carcinoma of the prostate as determined by rectal examination was obvious. Many of them were in retention. They were all hospital patients and all were improved by the administration of Tace as an initial procedure. Because we believe in early orchiectomy, they have all been castrated and are being continued on Tace medication. Of the 21 cases, the diagnosis has been confirmed by biopsy in 14. Their improvement has been equal to, if not greater than, that seen with other plans of therapy. So far none of them has shown any tendency to recrudescence, but it must be remembered that they have been under observation for no longer than 18 months.

Group 3 is composed of 17 cases who have been under observation for a period varying from 3–7 years. All were under treatment prior to the beginning of the investigation. All were castrated at the beginning of treatment and were kept on stilbestrol until changed to Tace. Bone metastases were present in 11 when the diagnosis was made, 12 have positive biopsies, all had marked urinary difficulty, 12 were in retention.

This group represents the rather far advanced cases which we would expect to show a definite recrudescence of their prostatic condition, irrespective of the plan of therapy used. So far, in only 2 of these cases have the patients shown evidence of recurrence: one, who had metastases at the beginning of treatment 6 years ago, has just died and another who also had metastases when first seen has after 4 years just recently developed a marked extension of his metastases.

The last group, composed of 7 cases, is similar to the above except that they are in the terminal phase of the disease. They were not changed from stilbestrol to Tace until after recrudescence was evident. Tace has been of little benefit in these cases.

In conclusion we feel justified on the basis of our encouraging preliminary observations in enlarging our studies on the new synthetic estrogen, Tace, in the palliative treatment of carcinoma of the prostate.

Union Central Bldg., Cincinnati, O.

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EVALUATION OF HORMONAL THERAPY FOLLOWED BY RADICAL PERINEAL PROSTATECTOMY ON SELECTED CASES OF ADVANCED PROSTATIC CARCINOMA

W. W. SCOTT AND (by invitation) A. L. PARLOW

From Department of Surgery, Division of Urology, University of Rochester, School of Medicine and Dentistry, Rochester, N. Y.

It is not surprising that the marked regression of the carcinomatous prostate that frequently resulted from hormone therapy would very quickly suggest a broadened field of usefulness for the radical perineal prostatectomy in selected cases of advanced carcinoma of the prostate. As far as we were able to determine from the literature, Vallet in 1944 was the first to report the use of this combined therapy in one of these cases, but unfortunately the patient died too soon after the operation to permit any conclusion as to its efficiency. In 1944, Scott and Benjamin reported 2 cases that had been treated by this combined therapy, and Colston recommended its use in selected cases. Earlier in the same year Parlow suggested that the combined therapy might be of definite advantage. In 1947, Colston and Brendler reported the results of this therapy on a series of 7 patients who had been operated upon within a period of 2 years. One of their patients had died of carcinoma in less than a year after operation. In 1948, Parlow and Scott reported having treated 14 cases by this combined therapy and presented 9 of them in detail; all of their patients were alive and apparently well at that time.

Inasmuch as any attempt to evaluate the efficiency of this combined therapy in the treatment of selected cases of advanced carcinoma of the prostate gland must take into consideration the type of case included in such a study, we believe it might be helpful if the factors that influenced us most in the selection of our cases were presented at this time. Of course those patients, in whom, because of recent origin or latency of growth, the carcinoma when first seen was so situated as to permit a reasonable chance for its complete removal by radical surgery should not be included in a study of this kind. All patients with proven metastasis when first seen should not be treated by this combined therapy regardless of the response to hormone therapy. Patients without metastasis in whom the local growth is a little too extensive to permit radical surgery when first seen, who fail to respond to hormone therapy, are not suitable candidates for the combined therapy. Where the local growth has advanced to such an extent as to result in the formation of a well-defined intervesicular plateau when the patient is first seen, it seems reasonable to assume that lymphatic and perineural extension beyond the palpable area has occurred even though the presence of metastasis cannot be proven. In such cases the follow-up radical perineal prostatectomy, while it might increase the patient's life expectancy and freedom from distressing symptoms, should still be considered of questionable value. However when the above have been excluded there still remains a very encourag-

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ing number of patients with carcinoma of the prostate from which the cases to be treated by the combined therapy can be selected.

These are the patients in the group of advanced carcinoma of the prostate without metastasis in whom the carcinomatous extension beyond the confines of the prostate, while not marked, is too great to permit its complete extirpation by radical surgery when the patient is examined. It is for the patients in this group, providing their response to hormone therapy has been such that a digital examination at the time of maximum regression suggests that complete extirpation of the carcinomatous lesion might be possible, that we believe a follow-up radical perineal prostatectomy offers a chance for a cure or failing in this will at least prolong the patient's life and freedom from distressing symptoms. But even some of these patients have to be excluded because advanced age or their general physical condition seem to contraindicate radical surgery.

It seems to us that the decision as to whether or not the patient is a suitable candidate for radical surgery is less difficult to make on the basis of his age than from the standpoint of his general physical condition. Because of their limited life expectancy and because carcinoma of the prostate is often a very slow process in patients who are 80 or more years of age, we have not used the combined therapy in any instance where the patient was that old when first seen. We have learned that as a result of careful preoperative and postoperative care, proper supporting measures during operation and the availability of very satisfactory antibiotics, the radical perineal prostatectomy, while sometimes requiring a little longer to perform, is seldom more disturbing to the patient than some of the more commonly used surgical procedures upon the prostate. At least 2 of our patients had a history of coronary disease with cardiographic evidence of damage and yet were no more disturbed by the operation than the average case. As a rule the operative risk due to the presence of general physical disability is little, if any greater than that of the other open operations upon the prostate for the correction of prostatic obstruction.

Up to the present time in the urological clinic of the Strong Memorial Hospital, we have treated 22 patients by this combined therapy. Of these we are reporting in detail 13 who have been followed 36 or more months since treatment was instituted. The remaining 9 patients have been treated too recently to justify any attempt to evaluate the efficiency of this therapy upon them. Clinical, serological and radiographic studies were negative for the presence of metastasis in the cases to be reported below. Furthermore all blood studies and renal function tests were within normal limits at the time of operation.

CASE REPORTS

Case 1. W. A., S. M. H., 192655, aged 58 when first seen on June 22, 1942 complained of gradual decrease in the size and force of his urinary stream. His father had died of carcinoma of the bowel.

His general physical condition was good except for a right inguinal hernia and a prostate that was enlarged in all diameters and was very hard but for a small area of second degree induration involving about one third of the left lobe towards the base. The very hard area extended from a point a little beyond the base of

the prostate and slightly into the region of the right seminal vesicle, down to the middle of the gland where it swung across to the left border. The apex was involved right down to the membranous urethra (fig. 1, *A*). There was a residual urine of 200 cc.

A study of a prostatic biopsy specimen revealed adenocarcinoma.

On July 13, 1942 an orchiectomy was performed and in August 1944, the cancer had regressed and softened so that there was but slight induration in the regions of the right outer border and base of the gland (fig. 1,B). Radical surgery was advised and rejected. However on November 2, 1945 the patient returned because of a slight recurrence of urinary symptoms and some increase in the size and induration of the base of the right lobe was discovered. He was placed on stilbestrol, 5 mg. a day, and his symptoms improved but his prostate remained about the same (fig. 1,C).

A radical perineal prostatectomy was performed on January 22, 1946; the patient was discharged 23 days later. His control was fairly good at that time but was not perfect until 5 months afterwards.

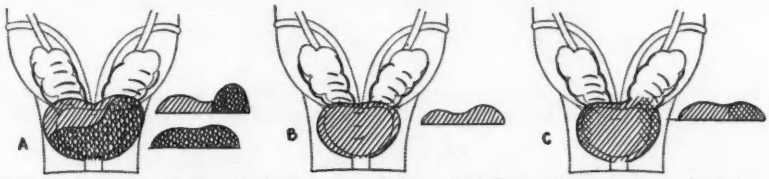

FIG. 1. *A*, prostate before orchiectomy on July 9, 1942. *B*, condition at time of maximum improvement on August 8, 1944, when prostatectomy was rejected. *C*, situation before radical prostatectomy on January 22, 1946 after 5 months of stilbestrol therapy.

Pathological studies of many sections from the surgical specimen failed to show typical carcinoma cells although the connective tissue structural appearance simulated that of adenocarcinoma of the prostate. Perhaps if serial sections of the entire specimen had been made, nests of typical cells would have been found.

The patient has been checked at regular intervals and, as of this date, is apparently well.

Case 2. O. J., S. M. H., 237491, aged 61, when first seen on September 17, 1943 complained of gradually increasing frequency, dysuria and dribbling of 3 years' duration.

He appeared to be in good physical condition but on rectal examination a prostate that was very hard and enlarged in all diameters was found. There was extension of third degree induration beyond the base to the region of both seminal vesicles (fig. 2, *A*). Pathological study of a punch biopsy specimen revealed adenocarcinoma.

Stilbestrol therapy of 5 mg. a day gave considerable relief of urinary symptoms but regression was slow so an orchiectomy was performed on April 5, 1945 and stilbestrol was continued. Four months later regression and softening in the prostatic area had become so marked that radical surgery seemed indicated (fig. 2, *B*).

He was operated upon on September 9, 1945 and his convalescence was uneventful except that he had almost complete incontinence for a period of 2 weeks following the removal of his catheter. He was discharged 28 days after operation and at that time his control was better but not perfect.

Pathological studies of the specimen showed adenocarcinoma.

All studies for recurrent cancer have been consistently negative and his urinary incontinence is only present on occasions of extreme physical fatigue.

Case 3. C. D., S. M. H., 211137, aged 72 when first seen on November 1, 1943 gave a history of gradual diminution in size and force of his urinary stream, increasing frequency and terminal dribbling of 6 months' duration. There had been no loss of weight.

The findings on physical examination were normal for a man his age except for the prostate which was moderately enlarged in all diameters, its median

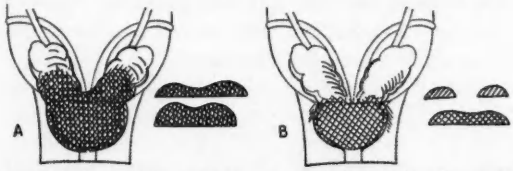

FIG. 2. *A*, prostate before stilbestrol therapy on July 2, 1943. *B*, condition after supplementary orchiectomy on July 17, 1945 and before prostatectomy on September 9, 1945.

FIG. 3. *A*, prostate before orchiectomy on November 11, 1943. *B*, condition at time of prostatectomy on November 14, 1944.

furrow and notch were shallow, its surface was moderately smooth but very hard, it was fixed in position and extension to the region of the seminal vesicles for a short distance had occurred on each side (fig. 3, *A*). His residual urine was 15 cc and a punch biopsy study revealed adenocarcinoma of the prostate.

Following orchiectomy, performed on November 22, 1943, regression which was slow and not marked except in the anteroposterior diameter of the gland, reached its maximum point on November 14, 1944 when a follow-up radical perineal prostatectomy was performed. At that time there still remained some induration extending for a short distance towards the seminal vesicle in each side (fig. 3, *B*).

Pathological studies which were positive for carcinoma suggested the possibility of extension beyond the borders of the surgical specimen in the region of the seminal vesicles.

The patient's convalescence was satisfactory and when he was discharged from the hospital 23 days after operation he was voiding satisfactorily and his control was perfect.

He received no estrogen treatment until a recurrent nodule was discovered on rectal examination 41 months after his prostatectomy. He was immediately placed on stilbestrol therapy which was later supplemented by deep x-ray therapy and local radium treatments and although he is still quite comfortable, it is evident he has not long to live.

Case 4. R. D. G., S. M. H., 218854, aged 56 came to us on May 29, 1944 because a hard nodule discovered in his prostate 6 months before, had been gradually increasing in size. He gave a history of a thrombophlebitis of the right leg many years back and a severe coronary attack with electrocardiographic changes 2 years previously. His father, one sister and one brother had died of cancer.

The prostate was moderately enlarged in all diameters and the median furrow and notch were shallow. In the left lobe towards the base was a very hard, fixed nodule that apparently had either pushed out or broken through the capsular border of the prostate for a distance of about 1 cm. and which was characteristic of cancer (fig. 4, *A*). On stilbestrol 5 mg. daily regression and softening of the nodule were so satisfactory that we were prepared to operate during the latter part of June when a second coronary attack made postponement necessary. His internist, believing that stilbestrol had been a factor in his coronary

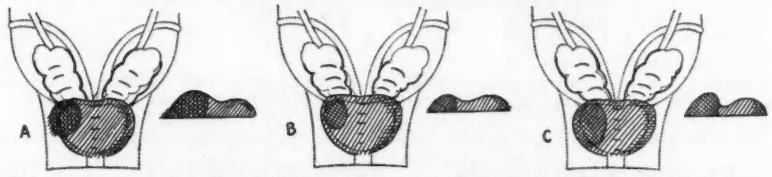

FIG. 4. *A*, prostate before stilbestrol therapy on May 5, 1944. *B*, condition at time of withdrawal of stilbestrol on June 26, 1944. *C*, prostate at time of radical operation on November 3, 1944, showing recurrence of tumor following stilbestrol withdrawal.

attack, withdrew the drug with the result that the suspicious nodule had again enlarged but seemed to be contained within the capsule when he entered the hospital on November 19, 1944 for preparation for operation (fig. 4, *B*). Phlebitic enlargement of his right leg and x-ray evidence of arteriosclerotic cardiac disease with left ventricular enlargement were also found. Electrocardiograph studies indicated a very considerable amount of cardiac damage.

On November 21, 1944 a radical perineal prostatectomy was performed and his convalescence was quite satisfactory. He was discharged 15 days after operation and at that time his urinary control was fairly good but not quite perfect.

Pathological studies were especially interesting in that it appeared as though perineural extension of the carcinoma beyond the border of the surgical specimen had occurred in one place.

Four months after operation he was placed on 1 mg. of stilbestrol every other day and 13 months later had a third coronary attack. His control became perfect but unfortunately he died of a primary carcinoma of the stomach 64 months after endocrine therapy had been started and 59 months after his operation. A very careful, complete autopsy failed to reveal any remaining prostatic cancer in the perineal region and no metastases could be demonstrated. All blood phosphatase studies remained normal.

Case 5. H. D., S. M. H., 245467, aged 72, who was admitted to the hospital on December 10, 1944 in complete urinary retention, gave a history of progressive frequency and difficulty with voiding of about a year's duration.

His prostate was markedly enlarged in all diameters, irregular and stony hard. Induration into the periprostatic tissue and over the lower borders of the seminal vesicles was present (fig. 5, *A*).

The patient was placed on catheter drainage and a punch biopsy study of the prostate was made and found positive for carcinoma.

An orchiectomy was performed on December 20, 1944 and when the catheter was removed several days later, he voided without too much difficulty. He was sent home on 1 mg. of stilbestrol a day.

The carcinoma regressed and softened to the extent that there remained only a small hard nodule in the base of the left lobe and extending but a short distance over the left seminal vesicle (fig. 5, *B*).

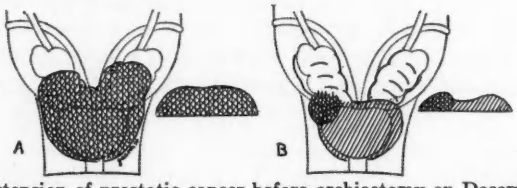

FIG. 5. *A*, extension of prostatic cancer before orchiectomy on December 12, 1944 and start of stilbestrol therapy. *B*, condition at time of radical operation on April 26, 1946.

His convalescence following the radical perineal prostatectomy on March 26, 1946 was uneventful and the patient was discharged with good urinary control 18 days later.

Pathological studies of the surgical specimen revealed carcinoma.

The patient has been followed at regular intervals and there has been no evidence of a return of the carcinoma.

Case 6. C. L., S. M. H., 231376, aged 59, was first seen on April 30, 1945 complaining of hesitancy, frequency and decrease in size and force of stream of 3 months' duration. He gave a history of valvular heart disease following rheumatic fever in childhood and 2 years before we saw him he had suffered a slight cerebral accident but there was no residual paralysis.

On rectal examination the prostate was found to be enlarged in all diameters and the median furrow and notch were shallow. In the right lobe was a large stony hard nodule that extended from the apex to the seminal vesicle and seemed to have pushed out or broken through the lateral border of the capsule. There was moderate induration extending up and over the right seminal vesicle for a short distance. The left lobe was soft and only slightly enlarged (fig. 6, *A*).

A diagnosis of carcinoma of the prostate was made and the patient placed on 5 mg. of stilbestrol twice a day.

On July 19, 1946, two days before his radical prostatectomy, he was free from symptoms, his residual urine was only 80 cc and his prostate had become soft and had regressed to a degree where radical surgery was considered advisable

(fig. 6, *B*). A little difficulty was encountered in freeing the right seminal vesicle and its covering fascia from the adjacent tissues because of dense adhesions. He left the hospital 21 days after operation and his control was fair but improved rapidly and was perfect within a few weeks.

A report by his urologist on April 15, 1950 resulted in negative findings and the patient is apparently well.

Case 7. G. A. W., S. M. H., 281682, aged 65, was first seen on June 18, 1948. Three years previous he consulted a urologist in another clinic who made a diagnosis of prostatic cancer and placed him on stilbestrol therapy. The carcinoma regressed and the patient was referred to us for radical surgery.

At that time the left lobe of the prostate was still of third degree induration and extension beyond the lateral border was felt to be present in one area (fig.

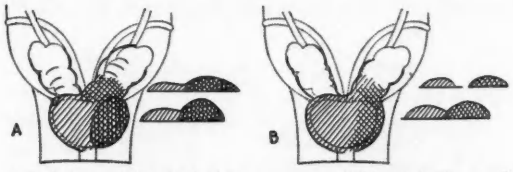

FIG. 6. *A*, prostate before stilbestrol therapy on April 30, 1945. *B*, condition before prostatectomy on July 16, 1946.

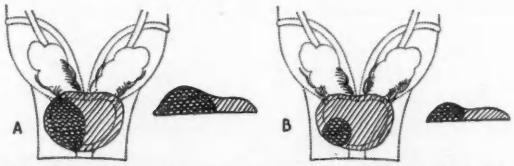

FIG. 7. *A*, prostate when first seen after 36 months of stilbestrol therapy which was started elsewhere. *B*, condition before radical operation on November 2, 1948, 5 months after orchiectomy was combined with stilbestrol therapy.

7, *A*). Orchiectomy was advised and within a few days the operation was performed.

The regression and softening of the carcinomatous area was so satisfactory that at the time of his prostatectomy on November 4, 1948 there remained only a small nodule located well within the border of the prostate. (fig. 7, *B*).

On November 4, 1948 a radical perineal prostatectomy was carried out with no difficulty. When discharged from the hospital 30 days after operation, the patient had no complaints referable to the act of urination.

Pathological examination showed carcinoma of the prostate.

The patient has resumed his normal life. He has been seen at regular intervals and there has been no clinical, x-ray or serological evidence of a return of the cancer.

Case 8. C. D., S. M. H., 210355, aged 61 when first seen in October 1943, in the course of a routine examination was found to have enlargement of the prostate gland with an area of second degree induration in the outer and upper third of the right lobe, which although it seemed to be benign, was sufficiently suspi-

cious so that the patient was advised to return for another examination in a month. During the next 6 months no change in the prostate was noted. He was next seen in August 1945, at which time the area of induration had become very hard and had definitely increased in size and seemed to have extended beyond the base and outer right border of the prostate (fig. 8, *A*). He was again lost until November 5, 1945 when punch biopsy studies of the involved area were made and found positive for cancer.

He was placed on 10 mg. of stilbestrol a day and the nodule softened considerably and regressed so much that on March 26, the day of his radical operation, it seemed to be confined within the prostatic capsule (fig. 8, *B*).

His heart showed definite evidence of coronary lesion trouble. There was a harsh systolic murmur and considerable enlargement with left venrtricular preponderance. The electrocardiogram revealed a bundle branch block.

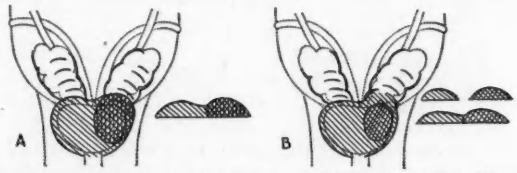

FIG. 8. *A*, prostate when patient was first seen on November 12, 1945 and placed on stilbestrol. *B*, condition before prostatectomy on April 11, 1946.

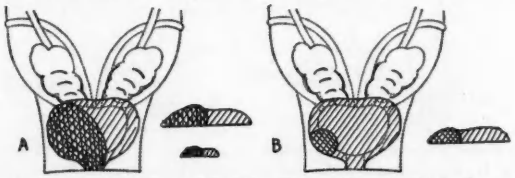

FIG. 9. *A*, prostate when first examined on December 19, 1945. *B*, prostate at time of prostatectomy on October 10, 1946.

He stood his operation very well and when discharged, 19 days later, was voiding with a good stream and good control. A recent examination revealed no evidence of recurrence and he has had no complaints referable to his urinary tract.

Case 9. W. F. D., S. M. H., 241866, aged 65, complained of a decrease in force and caliber of his urinary stream and increasing frequency of several weeks' duration when first seen on December 19, 1945.

He appeared to be in good general physical condition. His prostate was definitely enlarged in its lateral and anteroposterior directions and the median furrow and notch were shallow. The left lobe was practically filled by a stony hard nodule which seemed to extend beyond its borders laterally and at the apex (fig. 9, *A*). This area was so characteristic of carcinoma that a punch biopsy study was not made.

The patient was placed on 10 mg. of stilbestrol daily and regression was so satisfactory that by October 17, 1946, the day of his radical prostatectomy, there

remained only a small nodule of second degree induration in outer and lower half of the left lobe (fig. 9, *B*).

He developed phlebitis of the left leg 14 days after operation which resulted in some residual edema at the time of his discharge 44 days after operation. His control was not complete when he left the hospital but became perfect shortly afterwards. One area in his gross surgical specimen at the time of operation appeared to be characteristic of carcinoma. The first sections that were studied showed no carcinoma and unfortunately repeat sections could not be made because the surgical specimen had been destroyed.

After operation the patient discontinued his stilbestrol therapy and in September 1949, a small recurrent nodule about the size of a dime in its greatest diameter was found a little to the left of midline and about 3 cm. inside the anal sphincter. This area was radiated by means of a radium needle containing the element and as a result of this therapy or an orchiectomy which was performed on October 4, 1949, has completely disappeared.

In the absence of histopathological proof of carcinoma we have included this case for the following reasons: 1) In similar cases we have found it necessary to

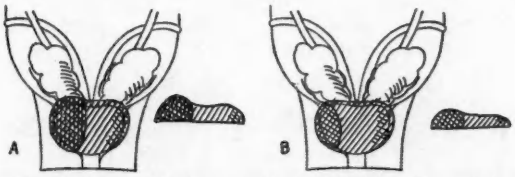

FIG. 10. *A*, prostate before orchiectomy on August 24, 1946. *B*, condition at time of prostatectomy, 9 months after stilbestrol therapy had been added.

cut numerous repeat sections before finding a microscopic area of carcinoma, 2) the gross specimen suggested the presence of carcinoma, 3) the response to estrogen therapy was similar to that which we have seen in proven carcinoma of the prostate, and 4) the recurrence was characteristic of carcinoma.

Case 10. R. DeF., S. M. H. 213732, aged 62, was first seen in 1945. He complained of frequent and difficult urination. A transurethral prostatic resection was performed on August 3, 1945 and urinary extravasation occurred. Following a suprapubic cystostomy and drainage of the space of Retzius on August 4, 1945, his recovery was rapid and quite satisfactory.

Pathological examination revealed no carcinoma.

On August 10, 1946 he returned complaining of hematuria and a second transurethral prostatic resection was carried out 7 days later.

Pathological examination showed carcinoma of the prostate.

He was given stilbestrol 5 mg. three times daily. On January 7, 1947 rectal examination revealed the left lobe of the prostate to be of third degree induration that extended over the seminal vesicle for a short distance (fig. 10, *A*).

Because response to estrogen therapy was slow, an orchiectomy was performed on July 22, 1947. Following this the carcinomatous nodule softened and apparently regressed to within the confines of the prostate (fig. 10, *B*).

On April 4, 1948 a radical perineal prostatectomy was carried out with little difficulty. The patient had an uneventful convalescence and was discharged from the hospital 21 days later.

Pathological studies revealed carcinoma of the prostate.

The patient has been followed at regular intervals. He has no complaints referable to the act of urination and there has been no clinical or serological evidence of a return of the cancer.

Case 11. A. B., S. M. H., 254201, aged 62, was admitted to the hospital on October 6, 1946, complaining of urine leakage through a suprapubic incision following the removal of bladder calculi 3 months previously in another city. He gave a history of frequent and difficult urination beginning in 1941, complicated by hematuria 4 years later. There was a past history of active pulmonary tuberculosis.

The patient seemed to be in good physical condition. Examination showed the prostate to be enlarged in all diameters. Occupying most of the right lobe and extending up for a short distance in the region of the right seminal vesicle was a very hard, irregular mass which was fixed and clinically characteristic of

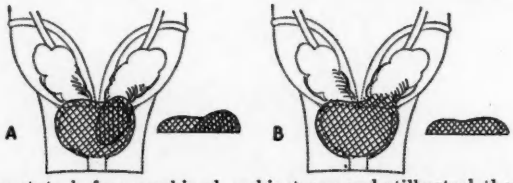

FIG. 11. *A*, prostate before combined orchiectomy and stilbestrol therapy was started in October 1946. *B*, situation at time of prostatectomy on May 8, 1948.

carcinoma (fig. 11, *A*). Prostatic biopsy studies were negative for carcinoma and there was no x-ray or serological evidence of metastasis. It was our opinion that he had a prostatic cancer which was too extensive to permit complete extirpation at that time.

On October 8, 1946 a bilateral orchiectomy was performed and the patient was placed on stilbestrol 5 mg. per day. The prostate regressed in size and became softer and the fistula quickly closed. By April 4, 1948 the carcinoma had apparently regressed to within the confines of the prostate except for a slight extension over the right seminal vesicle (fig. 11, *B*).

On May 8, 1948 a radical perineal prostatectomy was carried out with no difficulty. His convalescence was uneventful. The catheter was removed 14 days after operation and when he was discharged from the hospital 6 days later, he had no complaints referable to the act of urination.

Pathological examination revealed carcinoma of the prostate with stilbestrol effect.

The patient has been followed at regular intervals since leaving the hospital. He has resumed his normal life and is bothered only by occasional hot flashes. There has been no physical, x-ray, or serological evidence of a return of the disease.

Case 12. D. M. D., S. M. H., 280226, aged 63, was first seen on May 28, 1948. He complained of difficulty in starting the urinary stream and dribbling during the previous 18 months.

The patient, a fleshy, white male, appeared to be in good physical condition. Digital examination showed the prostate to be moderately enlarged in all diameters. The left lobe was smooth and elastic. On the outer portion of the right lobe there was an area of third degree induration that extended beyond the confines of the prostate, reaching from the apex almost to the base (fig. 12, *A*). A biopsy study showed carcinoma of the prostate.

He was given stilbestrol 25 mg. per day. On this therapy the prostate regressed definitely in size. The patient, however, was unable to tolerate the drug and on August 12, 1948 a bilateral orchiectomy was performed. Following this operation the prostate continued to regress in size and became softer. Eight months later it was felt that radical surgery was feasible (fig. 12, *B*).

On April 12, 1949 a radical perineal prostatectomy was performed. The catheter was removed 14 days following operation. Four days later the patient was dis-

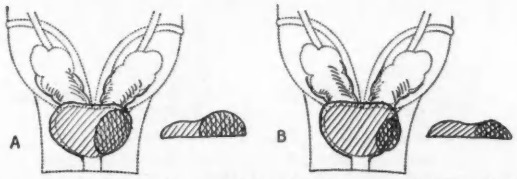

FIG. 12. *A*, prostate after intermittent stilbestrol therapy of 18 months' duration started elsewhere. *B*, condition at time of prostatectomy, 10 months after orchiectomy was combined with stilbestrol therapy.

charged from the hospital. At this time he had no complaints referable to the act of urination.

Two months later the patient developed frequent urination and some incontinence. A short time later he passed a stone following which the incontinence and urinary symptoms disappeared. As of this date there has been no physical, serological or radiographic evidence of return of the cancer.

Case 13. F. E. W., S. M. H., 263048, aged 64, was first seen on April 25, 1947. He complained of frequent urination associated with a gradual diminution in the force and caliber of the urinary stream during the previous 9 months. There was no history of loss in weight, hematuria or back pain.

Physical examination revealed a white male apparently in good physical condition. On rectal examination the prostate was definitely enlarged in all diameters. It was smooth, fixed and of second degree consistency on the right. On the left the consistency was stony hard and there was extension to the seminal vesicles (fig. 13, *A*).

Biopsy studies of the prostate revealed cancer.

He was given stilbestrol 5 mg. per day and his urinary symptoms disappeared. The carcinomatous area softened and regressed so satisfactorily as to permit radical surgery (fig. 13, *B*).

On July 5, 1947 the prostatectomy was performed. This procedure was complicated by a tear in the rectum which fortunately was discovered and closed. The wound healed uneventfully and the catheter was removed 16 days following the operation. When discharged from the hospital 2 days later he was voiding a stream of good force and caliber and had perfect control.

Pathological studies revealed carcinoma of the prostate with extension to the tissue about the seminal vesicles.

The patient was followed at regular intervals and on September 5, 1947 he complained that he was having some difficulty in voiding. A cystoscopic examination revealed a stricture at the vesical neck that was resected following which the urinary symptoms disappeared.

Pathological studies revealed granulation tissue with no evidence of malignancy.

The patient has gone back to work, feels well and has no complaints referable to the act of urination. Frequent studies have shown no clinical or serological evidence of a recurrence of the cancer, either local or metastatic.

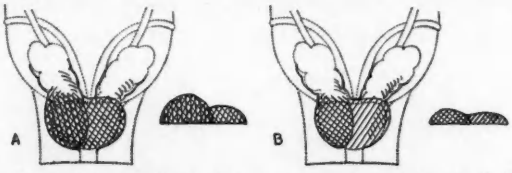

FIG. 13. *A*, prostate at time stilbestrol therapy was started on April 25, 1947. *B*, condition at time of radical prostatectomy on July 5, 1947.

RESULTS AND DISCUSSION

The results of endocrine therapy plus radical perineal surgery in our first 13 cases, presented above, have been most encouraging. All of these patients have been under treatment 36 months or more. The average time that has elapsed since the institution of endocrine therapy is 62 and the longest 95 months. The average time that has passed since the radical perineal prostatectomy was performed is 41 months; the longest interval 67 months and the shortest 13. The only death in this series (case 4) was due to a primary carcinoma of the stomach that occurred 64 months after endocrine therapy was started and 59 months after prostatic surgery. A very complete autopsy was performed and a special search was made for recurrent or residual carcinoma in his perineal region because pathological studies of the surgical specimen suggested that extension beyond its border had occurred in one place. No tumor was found and metastasis from his original growth was not demonstrated. Neither of the two patients with local recurrence continued his estrogen therapy after prostatic surgery. In our first patient in whom this was discovered, histopathological studies of the surgical specimen suggested that carcinoma has been left beyond its borders in the region of each seminal vesicle. When the recurrence was found, 41 months after prostatectomy, he was placed on stilbestrol which was later supplemented by deep x-ray and local radium therapy. While at the present time, 26 months later, the patient is comfortable, it is evident he has not long to live. The second patient

(case 9) was the one where the surgical specimen was lost shortly after the sections for pathological study, which were negative for cancer, were cut. The remaining patients in this group are apparently quite well.

Due to a study by the members of the Urosurgical Society of the results of endocrine therapy on a series of 540 cases of carcinoma of the prostate that were without metastasis when first seen, a very satisfactory yardstick has been obtained for measuring the efficiency of other types of therapy upon patients in this stage of the disease (table 1). It is interesting to note that better results were obtained where orchiectomy and stilbestrol therapy were combined than when either one was used alone. When these results are compared with a control series by Nesbit and Plumb, consisting of 388 similar cases which were treated by the methods in common use before the introduction of endocrine therapy, we find that only 34 per cent of the former as against 70 per cent of the latter were dead at the end of 36 months. While we believe it would be unwise to attach too much significance to the results of a comparative study between a control

TABLE 1. *Per cent survival at 6 month intervals of 540 cases of carcinoma of the prostate without metastasis treated by endocrine therapy. (From study by Urosurgical Society.)*

	MONTHS						NUMBER ELIGIBLE	PER CENT DEAD NOT DUE TO CA
	6	12	18	24	30	36		
Stilbestrol	90.7	82.2	75.6	69.1	56.2	49.7	142	34%
Orchiectomy	91.6	84.9	74.0	65.9	62.2	53.4	239	26%
Orchiectomy and stilbestrol	95.6	89.3	82.3	76.0	70.0	66.0	159	37%
Total cases							540	

It appears that when orchiectomy and stilbestrol are combined in treatment of cancer of prostate, result is more satisfactory than when either is used separately.

series consisting of 540 cases, such as that of the Urosurgical Society, and our small series of 13 cases, we would like to point out that all of our patients were living at the end of 36 months, whereas 34 per cent of the patients treated by stilbestrol and orchiectomy combined were dead and 66 per cent of the deaths were due to cancer of the prostate.

We believe that our results are sufficiently encouraging to warrant further trial of this therapy, not only by us, but by others. Even if the results in our remaining cases are not as good, and we doubt that they will be, we believe that this treatment in most instances, where judiciously used, will prolong the life of the patient and increase his period of freedom from the distressing urinary symptoms that almost inevitably accompany the late stages of this disease. As pointed out previously, the operation entails little or no more risk than other open operations for relief of prostatic obstruction. Furthermore, the introduction of the "traction suture" method of closure by Vest has done much to prevent incontinence that occasionally resulted from this type of surgery.

In some cases of carcinoma of the prostate in which the response to endocrine therapy has been very satisfactory, it is sometimes very difficult to demonstrate

the presence of residual carcinoma by means of microscopical studies of sections from the surgical specimen. We have had that experience in two of our recent cases. In both of these a clinical impression upon rectal examination by at least two of the senior members of our staff, repeated positive studies of the prostatic secretion prepared by the Papanicolaou method and interpreted by a cytologist especially skilled in this particular field, and regression and softening of the suspected area following endocrine therapy, all pointed so strongly towards carcinoma that a follow-up perineal prostatectomy was performed. Pathological studies of many sections from both specimens repeatedly showed connective tissue formations very similar to those found in cancer of the prostate but the epithelial cells were either absent or so changed by the endocrine therapy that a positive diagnosis of cancer could not be made. It is our belief that had serial section of the entire specimens been made, nests of carcinoma cells would have been found. We have been greatly influenced in reaching this conclusion by an experience in one case and observations made from repeated cytologic studies in others. Pathological studies of a biopsy specimen obtained from the first patient in our series on his initial visit were typical of carcinoma of the prostate. Following orchiectomy and estrogen therapy, a radical prostatectomy was performed 42 months after his first visit. Pathological studies of many sections from his surgical specimen revealed the same connective tissue structural appearance mentioned above but again typical carcinoma cells were not found. Cytologic studies in the two recent cases mentioned above showed progressive effect of endocrine therapy on the malignant cells, which were plentiful when the patients were first examined. In one case, after 6 months of therapy, the malignant cells completely disappeared and remained absent until the radical perineal prostatectomy was performed 2 months later. While the malignant cells in the prostatic secretion of the second patient did not completely disappear, they did decrease markedly in number and showed marked estrogen effect before operation. It would seem that where a decision has been made to try the combined therapy described above and where the operator is unwilling to proceed with radical surgery without positive histopathological support, such studies should be made before endocrine therapy has been instituted.

In our opinion, all patients who have had a radical prostatectomy for cancer of the prostate gland should continue a routine course of some type of estrogenic therapy for a very long time after operation, regardless as to whether they were treated in the manner presented above or belonged to the more fortunate group, in which because of the size and location of the carcinomatous nodule, a preliminary course of endocrine therapy did not seem necessary. It is not always easy to convince some of these patients, who are feeling well and know that the organ which was the source of their trouble has been completely removed, that they must continue estrogen therapy even though at times it may cause some discomfort. However, the reasons for the postoperative continuance of estrogen therapy are so obvious and valid that even the most stubborn patient can be convinced of its necessity without creating a cancer phobia, if patience and discretion are exercised in their presentation.

CONCLUSIONS

The first 13 in a series of 22 selected cases of advanced carcinoma of the prostate that were treated by endocrine therapy combined with a follow-up radical perineal prostatectomy have been presented in detail.

While this report has not been submitted as an evaluation of the ultimate mortality in such cases, we believe the results to date warrant a further trial of this therapy, not only by us, but by others.

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DISCUSSION

DR. J. A. C. COLSTON (Baltimore, Md.): I feel that it is my duty to show these slides because, 4 years ago, I presented a small series of 7 cases of extensive carcinoma of the prostate that were obviously inoperable when the patients were first seen, but were subjected to stilbestrol therapy. We know, of course, that stilbestrol causes definite regression of the malignant disease, and our idea was that if regression occurs, it must mean that certain cells are killed. Certainly, all the malignant cells are not destroyed because no case has yet been reported in which complete eradication of prostatic cancer has resulted from hormone therapy alone.

These cases were given stilbestrol for varying lengths of time. They are all now over 5 years since the radical operation was performed, and it is my intention to describe the ultimate result which has been obtained in these cases. In every case, the radical operation was carried out without complications except in one in which a stricture developed, and suprapubic diversion of the urine was necessary, with dilatation of the stricture, but an excellent ultimate functional result was obtained.

(Slide) This first case was done in 1944. The extension is quite evident toward the apex, which we think is pretty much a contraindication for the radical operation, but under stilbestrol therapy, for 2 months, it had regressed to such a degree that the radical operation was carried out. This patient had clinical evidence of recurrence in 1947. He was given stilbestrol. I might say that none of these patients was given stilbestrol after operation, and I think that was a great omission because I think that there is one thing that Dr. Scott's very interesting paper has shown: the importance of continuing stilbestrol in the hope that if any cells are left behind, they may be controlled by estrogen.

This patient died after clinical recurrence was present. He died in January 1950, or 7 years after. The autopsy showed hemorrhages in the mucous membranes and evidence of blood in the peritoneal cavity, but no evidence of carcinoma. In spite of that, because of the fact that it was clinically thought that he had a recurrence in 1947, I have not put him down as a cured case.

(Slide) This patient was done in 1944. As you see, it was a very unfavorable case for radical operation. Under stilbestrol, there was this rather dramatic regression of the disease. The radical operation was done and he had a good result but died in 1949, which was 5 years after operation, with local recurrence and metastases.

(Slide) Here, again, is a very extensive case; in pre-estrogen days, we would not have done a radical operation on him. He regressed in a very spectacular manner. The radical operation was done in 1944 and he is still alive. Local recurrence occurred in 1948. He has had stilbestrol and orchiectomy, and at present is comfortable but with obvious recurrence. I think that possibly if we followed Dr. Scott's plan of placing him immediately after the radical operation on either stilbestrol or orchiectomy, the recurrence might not have occurred. But that is rather theoretical.

(Slide) This was quite a favorable case when first seen in 1944. There was, again, spectacular regression. He was operated on in 1944 and a recurrence developed in 1946. Here, again, stilbestrol had not been given but was started then without much response, and orchiectomy was done. He is very comfortable and well clinically, but has definite recurrence. Here, again, I regret very much that we did not give him stilbestrol or do an orchiectomy after the radical operation.

(Slide) This is an extensive case that we thought obviously inoperable, but after 6 months of stilbestrol, there was this very marked regression, and the radical operation was performed in 1945. He had a recurrence 18 months later, and in 1948 he was treated by stilbestrol and orchiectomy. In 1948, he developed a carcinoma of the rectosigmoid for which colostomy was done, and he died some months after that. This, microscopically, had nothing to do with the original tumor but on careful autopsy, a nodule of definite recurrence of the original growth was found.

(Slide) This was a very favorable case, or fairly favorable case, for radical operation, but there was extension into the right seminal vesicle. Spectacular regression occurred under stilbestrol and in 1945, a radical operation was done. This was a great disappointment. Here, again, we did not give treatment following operation. This patient developed a local recurrence a year after operation and died shortly thereafter in spite of stilbestrol and orchiectomy.

(Slide) The last case was a disappointment from a functional standpoint. Here is a case of very extensive carcinoma, seen in 1945. A regression occurred under stilbestrol, but there was still considerable induration in the region of the left vesicle. He was subjected to radical operation and made a complete recovery except that he developed a stricture, which, as you all know, may occur at the site of the anastomosis. In our experience, this condition usually can be controlled by careful dilatation. However, elsewhere the constriction was attacked by transurethral resection, and this has resulted in almost complete incontinence. This is the only case in this small series that has had complete incontinence. He is dry at night but when he works or when he goes turkey shooting, he has to wear some method of control of his incontinence. This patient was done in 1945, shows no recurrence today, and is perfectly well clinically.

I thought that it was my duty to show you these patients because they are all over the 5-year period. The results have not been quite what we hoped when we started on this plan. We hoped that of these inoperable cases, we might be able to salvage one or two, but all we have been able to accomplish is that a good many have lived past the 5-year period, and we have only 1 case living and well and free from clinical recurrence or metastases 5 years after the operation.

I think if there is any conclusion to be drawn—I am a great enthusiast for giving these patients preliminary estrogen therapy, even in the case where a small nodule is present, which is what we might call an ideal case for radical operation. We give such patients estrogen therapy simply on the basis that if we believe that certain cells or a certain number of cells can be destroyed by estrogen therapy, the patient should be given the benefit of this treatment be-

fore the radical operation is carried out. We know that all these malignant cells will not be killed, but a certain number will be, and the possibility of a complete cure thereby enhanced.

In summary, the 7 patients with carcinoma of the prostate too extensive for radical operation when first seen were given stilbestrol at varying periods of time. In all these cases regression occurred to such an extent that it was technically possible to carry out the radical operation. It is now 5 years since these 7 operations have been performed. One patient died of recurrence and metastases 1 year after operation; 3 died with recurrence and metastases 5 years after operation; 2 patients are living with clinical recurrence 6 years after operation; 1 patient is living without clinical evidence of recurrence or metastases 5 years after the operation. In all patients except one an excellent functional result was obtained, and complete urinary control was established within 2 or 3 months after operation. In the 1 patient with incontinence during the day, a constriction at the site of the anastomosis between the urethra and the bladder was treated elsewhere by transurethral resection. After convalescence had been completed, none of these patients subsequently developed urinary obstruction, and no secondary operations were necessary.

I should like to conclude by stating that as a result of Dr. Scott's study, I shall henceforth continue estrogen therapy in all cases following radical perineal prostatectomy.

Dr. T. Leon Howard (Denver, Colo.): I desire to discuss the paper written by Dr. Herbst, for I admire anybody who can figure out all the steroids and their chemical formula, as the doctor has just done. But, of course, you will have to admit he is one who is in a position to do so better than any of the rest of us, for he lives in an environment in which steroids are probably in greater use than in any city in the world, our National Capital.

Dr. Herbst brought out the effect that the testosterone preparations have on other body glands, but he mentioned only casually the kidneys in relation to this oxalate group. Over several years, I have noticed the effect of the testosterones in renal conditions, especially in children. I found a good many years ago that male children with renal rickets all had hypogonadism and apparently there was some relationship between hypogonadism, the involvement of the joints, the parathyroids and the kidneys. The now famous "Nubbins" Hoffman child demonstrated to me very clearly that testosterone had some very markedly stimulating effect on the excretion of the urine in a hypoplastic type of kidney.

In this child whom you read so much about, I saw him at one time when his nonprotein nitrogen was 160 mg. per 100 cc of blood and I thought he would unquestionably be dead in the next 48 hours. Roentgenograms of his epiphyseal areas had been made that same morning, because I had become suspicious that he was undergoing renal rickets and his blood phosphorus-calcium ratio had begun to reverse itself. An examination showed he had very small testicles, and he was immediately put on testosterone, 25 mg. every second day, which was reduced later, and, almost spectacularly his nonprotein nitrogen started falling and dropped to 70 mg. of mercury per 100 cc. Under this regimen of treatment,

which if deviated from at all he immediately showed a general relapse, he returned to school and he was able to take two trips across the United States the following 2 years after institution of testosterone treatment.

I advise you who have cases that have come into you at about the age of puberty, with a diagnosis of orthostatic albuminuria or other types of albuminuria to re-check these patients, especially if they are males and see how many of these boys have squared-off pubic hair, small testicles and are apathetic to all sports. They, too, have lost all interest in school activities. Start them on 10 mg. of testosterone twice a week just for your own edification, because I am sure you have tried everything else and see how many of them respond spectacularly to this form of treatment. You don't have to wait any great length of time for the improvement to begin either.

We have seen those cases, in which apparently there was a lower nephron nephrosis act just as spectacularly, not only in the male but in the female.

So, I hope Dr. Herbst in closing will express an opinion on the second effect on the kidneys, because experiments have shown that a kidney increases one-fourth in weight in the lower animals under steroids. Consequently, I cannot see why some such increase in size should not occur in the human.

DR. EDGAR BURNS (New Orleans, La.): I would like to ask Dr. Smith if he has noticed any change in metastatic lesions following the use of tace.

DR. RICHARD CHUTE (Boston, Mass.): If one may ask a question of a discusser, what dose of stilbestrol do you use, Dr. Colston?

DR. ROGER C. GRAVES (Boston, Mass.): I would like to ask Dr. Smith whether tace is now available, and what the dosage is.

DR. W. H. TOULSON (Baltimore, Md.): I would like to say that a few months ago, I was visiting Dr. Smith and I saw this very patient. The very remarkable result that he got from using this new drug led me to obtain some for experimental work about a month or a month and a half ago. I have used it in only 7 cases, and they are unfair tests of the drug because the patients had far advanced cancer of the prostate gland, but I would say that in those cases in which I have used it, none of them has had any unfavorable reaction and they all tolerate the drug well. Of course, it is much too early to make any prediction about the drug.

DR. COLSTON (Closing): In reply to Dr. Chute's question, we have not used any large doses. We have usually used 1 or 2 mg. a day, sometimes 3. I do not know what the indication is for 3. But usually our plan is to give them one milligram a day.

DR. WILLIAM P. HERBST (Closing): In regard to Dr. Howard's observations, I said so much about the effects of steroids that I was ashamed to go into that particular problem. However, we have had the opportunity to observe clinical changes in renal insufficiency problems which are not at all unlike what Dr. Howard has described.

There were two rather spectacular cases in this regard which I would like to comment on. One was a young boy, about 9 years of age, who was seen because of a very severe degree of nephritis—and I don't attempt to classify nephritis

because I don't believe it is possible to be anywhere near as accurate in classification as those who have devised a classification would lead us to believe. This youngster had a very marked amount of albuminuria, his nonprotein nitrogen was up, and the internist told the parents to allow the boy just to enjoy life because his prognosis was hopeless.

That boy was given testosterone in the form of metandren tablets, over 5 years now, and that youngster has developed into a physical specimen who is able to engage in all types of physical activity, whether it is tennis, football, or what not, and there is no more albuminuria, his nonprotein nitrogen is normal, and he is, in my opinion, an instance of a rather spectacular response to the administration of testosterone for a marked degree of renal insufficiency.

There was another individual who was given up, who had about as much albuminuria as I have ever seen, who worked in an A and P store. He was put on testosterone along with general supportive measures, and he also had a markedly elevated nonprotein nitrogen. He has become completely rehabilitated so that he not only carries on his responsibilities in the A and P store, but he also insisted upon engaging in golf in a rather vigorous way, in spite of advice to the contrary.

I have no idea as to the explanation of this, except the observations that Dr. Howard referred to; namely, the direct effect of testosterone on renal epithelial cells.

Now, there are quite a few reports on the influence of not only testosterone but also the other steroids on renal epithelium. One is to the effect that testosterone produces these demonstrable hyperplasias, DOCA produces some but less so, stilbestrol questionably so, and stilbestrol is supposed to alter the cell fluid balance in favor of fluid retention in so far as the individual cell is concerned.

With regard to the pituitary, nobody said anything about the pituitary but there is no question about its being involved. Sauer in Buffalo reported the treatment of prostatic malignancy by pituitary radiation. I have observed several cases myself. There is no question but that radiation of the pituitary in some instances is very definitely effective in so far as altering the course of extensive, advanced carcinoma of the prostate is concerned.

With regard to reversibility or irreversibility of sex types following the administration of these sex hormones, sometime ago, Dr. Deming, as you recall, vigorously supported the policy of bombarding—using his words—these patients with stilbestrol; in other words, don't use 5 mg. or 10 mg., but 15 mg. at least daily. In an attempt to comprehend this type of therapy, it appears to me that when we bombard these patients, while they may experience a spectacular and satisfactory temporary result, yet, looking at it more broadly, it is my feeling that our own chemical economy resents imbalance vigorously. The greater degree to which we upset it, the more rapid and the more vigorous are the attempts on the part of the economy to compensate for it.

For that reason, I have the feeling—and I can't prove it, and I don't think Dr. Deming or anybody else has proved to the contrary up to the present time

—that the smallest dose we can possibly use with satisfactory response, in so far as the clinical course of the patient is concerned, is the proper dose.

In so far as reversibility is concerned, it may be that if we bombard them and then discontinue therapy, that individual may assume a female pattern and remain on a female pattern and not revert to the original male that he started out with.

In so far as the adrenals go, our autopsy findings demonstrate the gross size of the adrenal has not been correlated with the clinical course of these patients.

With respect to castration versus estrogen, it is rather interesting to realize and observe that when we have lost control with castration, we can again give estrogen and get continued control, and vice versa. If we have given the estrogen with control and lost it, castration will subsequently give additional control in many instances.

Dr. Scott of Brady in Baltimore has also had some very interesting observations with respect to the administration of testosterone in some of these patients, whose clinical course has gone out of control. He has observed, in a sizable number of instances, temporary improvement in clinical course following the administration of testosterone.

In so far as life expectancy is concerned, we can say that it has been increased, not less than two years.

There is one thing on which I should like to comment: that is, the question of priority as to treatment by estrogens. When Charles Huggins reported his cases, he did not report the use of estrogens in treatment of prostatic carcinoma; not only did he not report it, but he criticized the use of estrogens in the treatment of prostatic carcinoma for several years, and it was not until, I think, 1945, that he came out with his first advocacy of treatment with estrogens. The first report on the use of estrogens was a paper I read before the Mid-Atlantic Section of the AUA in March 1941, in which observations were presented on the effect of the administration of estradiol diproprionate, and stilbestrol in cancer of the prostate.

This problem of steroid chemistry, is a very complex subject. Unfortunately, it is individual and there is no possible way at the present time to predict what the course in any one individual is going to be until we see it.

There is one other thing on which I should like to comment: that is, Dr. Colston's expression of regret that he did not give these estrogens immediately after surgery. He cannot be sure, and none of us can be sure, in my opinion, as to whether that was or was not a mistake. My own feeling is that our best policy is to wait until the patient experiences an unsatisfactory trend from the development of carcinoma before the institution of castration or the administration of estrogens.

With regard to Dr. Smith's contribution, apparently this is a most satisfactory estrogenic-like material to use in the treatment of these cases. However, he stated that when they had lost control in these advanced patients by the administration of the other estrogens, tace was not effective to any further degree, which puts it in the category of most other estrogens in so far as our ability

to extend life expectancy is concerned. The utilization of Tace from beginning to end may eventually prove to be our most satisfactory single estrogen. In the early period of observations on this problem, it was our hope that if we had the opportunity to try a series of different estrogenic-like substances, we might find that when we lost control with one, we could then have subsequent further control by the utilization of others. Unfortunately, that has not been true up to the present time. I think we can continue to hope that somebody may evolve and synthesize a substance which will be successful in so far as continued control is concerned.

DR. JOHN K. ORMOND: May I interrupt to ask a question concerning this? Where you have been giving stilbestrol, with regard to its effect on the epithelium, do these patients have to continue using it all their lives or is it just a temporary matter? In youngsters who are using it, does the necessity for it disappear eventually?

DR. HERBST: The first boy that I described to you has had his testosterone discontinued as of about six months ago.

DR. ORMOND: How old is he?

DR. HERBST: I think he is now 14.

DR. PARKE G. SMITH (Closing): In answer to Dr. Burns about metastases, we have 1 case in which there has been a definite healing as evidenced by the laying down of new bone in the body of the second lumbar vertebra. I think that the most I can say about bone metastasis as visualized with the x-ray is that it is my impression that at least we are not having progress of the metastasis in a good many cases.

So far as the availability of Tace is concerned, it is not on the market. It is available only for experimental purposes. The dosage that we have been using is 24 mg. of Tace daily, which is the stilbestrol equivalent of approximately 4½ mg.

DR. WINFIELD W. SCOTT (Closing): I want to thank Dr. Colston for presenting his series of cases. We realize that this is a very controversial subject, but we do believe that the only way we are going to find out something about this combined therapy is to try it, and that is what we are doing.

With reference as to whether the patient with advanced carcinoma of the prostate without metastases when first seen should be treated by orchiectomy at once or whether the estrogen therapy should be tried first, or whether he should not be treated by either or both until he has developed pronounced symptoms, the survey by the Urosurgical Society seems to give us a definite lead. You may recall that the survival rate over a 3 year period was as follows: stilbestrol therapy 49.7 per cent, orchiectomy 53.4 per cent and when these were combined, 66 per cent. If we can draw any conclusions from a study of that size, it would seem that better results can be expected where these two types of therapy are combined than when either is used separately. Certainly these results are much better than those obtained in similar cases before the use of hormone therapy. Therefore I am inclined to believe that once the diagnosis has been made we should not withhold hormone therapy, in fact, it would seem advisable to give the patient the benefit of both types as soon as possible.

The results obtained by combining hormonal therapy with the radical perineal prostatectomy in selected cases of advanced carcinoma of the prostate without metastasis will be governed by a number of factors that are presented in detail in our paper but which I did not have the time to present this morning. One of these we know very little about, that is, what governs the reaction of the host to the cancer? Until Dr. Colston presented his cases this morning I was of the opinion that where a well-defined intravesicular plateau is present when the patient is first seen, he should not be treated by this combined therapy. If I recall correctly, his best result was in such a case and it may be that we have been too conservative in such cases.

I do not want to close without mentioning the fact that in our opinion, the introduction of the traction suture method of closure by Vest has done much to eliminate the occasional cases of incontinence that occurred following the old method of closure in the radical perineal prostatectomy. The only case of stress incontinence that we have had in this series was one where we used the old method. I am inclined to think it might also do away with the postoperative stricture that occasionally occurs, at least we have not had this complication since we started to use the Vest method.

Dr. J. A. C. Colston (Baltimore, Md.): I want to say just one word that I neglected to say; that is, the functional result that follows even when recurrence does take place. We have had several cases in which recurrence has taken place. It usually occurs in that phase that Dr. Scott mentioned, and the recurrence will be high up between the rectum and the bladder where it will not interfere with function of either viscus. It does not invade the rectal wall or the bladder wall. Therefore, there is no interference with rectal or bladder function. In some of these cases, such a recurrence may be present for many years, and will grow very slowly, or indeed lie dormant.

I had such a case in which recurrence was obvious 4 years after the radical operation. A perfect functional result had been obtained and the patient lived with that recurrence for 14 years. He then died of a coronary. The attending doctor was kind enough to send us the genito-urinary organs, and we found an area of recurrence about 3 by 2 cm. high up between the rectum and the bladder, which was a definite adenocarcinoma. Yet, there was no bony metastasis, and there was no interference with urinary or rectal function.

I think that is a very important point, because that patient, had he been treated by transurethral resection when first seen, I am certain, would have had a recurrence, recurrent obstruction would have developed, and probably numerous resections would have had to be done.

MANAGEMENT OF OCCULT PROSTATIC CARCINOMA

REED M. NESBIT AND WILLIAM C. BAUM

The rational clinical management of occult prostatic carcinoma has always offered the urologist a problem in therapy, solved in most instances by the practice of conservative observation rather than further radical extirpation of the entire gland and its adnexal structures. Many physicians have used this regimen in the belief that most of these patients live their normal life expectancy without the development of the evident features of prostatic malignancy.

Moore, Baron and Angrist, and others have emphasized the relatively high incidence of occult prostatic carcinoma in their studies of men past the age of 40 who came to postmortem examination. Considering the frequency with which they found unsuspected prostatic neoplastic activity, it is surprising that the proportion of men who present themselves for the diagnosis and therapy of prostatism, and who are subsequently found to have cancer of the prostate, is not materially higher. One is forced to conclude that from the standpoint of pathogenesis, these occult tumors seem to possess a different pattern or rate of cellular activity than those whose origin is in the posterior lamella, and which are commonly recognized on digital rectal examination. Most practitioners are acquainted with the usual rapid progress of this classical lesion when left untreated. Nesbit and Plumb have shown that even in those who present no evidence of metatases when first seen, the average survival is but 24.7 months from the time of initial diagnosis.

If it be true that the prostate is capable of playing host to two types of adenocarcinoma, having at least different clinical characteristics, must we then develop a philosophy of therapy to fit each circumstance? The choice of radical perineal prostatectomy for the early palpable carcinoma limited to a small area within the capsule has become accepted practice, for it has been shown that surgical removal offers the only real opportunity for cure in such instances. But should this principle be extended to include all cases of occult carcinoma found after transurethral, suprapubic, retropubic or simple perineal prostatectomy? The Hinmans in a recent publication have suggested that such a program be established and have presented interesting data in a small closed series of cases to support their contention that a survival advantage is apparent when simple prostatectomy is followed by radical surgery should the original tissue removed show evidence of clinically unsuspected neoplastic activity.

These results are somewhat at variance with the published findings of G. J. Thompson of the Mayo Clinic who reported a 60.9 per cent 5 year survival in 112 patients in whom clinically unsuspected adenocarcinoma was discovered following transurethral prostatectomy. It was our impression that the experience of Thompson paralleled that of this institution. As a result, we were stimulated to investigate the survival of 63 patients seen in the University Hospital in the past 16 years in whom a diagnosis of prostatic carcinoma was made after prostatectomy and similarily was unsuspected prior to operation. Forty-two of these

patients were followed in sufficient detail to allow accurate clinical evaluation of their progress following therapy. The results of this survey are presented in the following paragraphs.

AGE DISTRIBUTION

The average age of the individual on whom this pathological diagnosis was made was found to be 74 years. The youngest was 52, the oldest 88.

PRESENTING SYMPTOMS

In all cases the presenting symptoms were those of prostatism. In 2 cases this was complicated by hematuria for which no cause was found but benign prostatic hypertrophy with associated venous engorgement. The average duration of symptoms was $1\frac{1}{2}$ years and varied from less than 1 week to 8 years.

FINDINGS ON EXAMINATION

In all cases but two the prostate gland was described as clinically benign in character and averaged 1 plus in estimated size. Two cases were considered to be suspicious of carcinoma by at least one examiner and both were found to have grade 2 adenocarcinoma infiltrating most of the tissue submitted. One of these patients died 18 months after diagnosis and the other is alive after 31 months of observation, free from symptoms. Neither case truly falls in the occult classification.

X-RAY FINDINGS

Examination of the bony pelvis and lumbar spine by x-ray was carried out in 29 of the 41 cases and in all instances showed no abnormalities attributable to prostatic carcinoma.

LABORATORY FINDINGS

Serum phosphatase determinations were made on 22 of the 41 patients in each case were within normal limits.

CHARACTER OF THE TISSUE REMOVED

An average of 32 gm. of tissue was removed from each case. The microscopic sections were reviewed in all instances, and the areas characteristic of carcinoma identified. From the histological standpoint this material did not constitute a homogeneous group. In many instances there were localized changes which would lead to a diagnosis of well differentiated, or grade 1 adenocarcinoma. In a less numerous group, small foci of less well differentiated carcinoma were found. The factor common to all of these was the conviction on the part of the pathologist that a diagnosis of carcinoma was justified.

SURVIVAL DATA

Twenty six of the 42 patients followed remained alive and free from symptoms. Fourteen of the 42 patients died of causes other than prostatic carcinoma, and as near as can be determined, were free from symptoms attributable to

prostatic cancer at the time of their demise. Two of the 42 patients died of prostatic cancer; one, 18 months after diagnosis, and the other, 168 months after first examination. The survival data on the 26 patients still alive are enumerated in table 1.

TABLE 1. *Survival data on 26 patients with occult prostatic carcinoma discovered following transurethral prostatectomy*

MONTHS SURVIVAL SINCE ORIGINAL DIAGNOSIS	NUMBER OF PATIENTS	PER CENT
148 144 104 102 84 72 66	7 patients with greater than five year follow-up.	26% 5 yrs.
52 51 51 49 48	5 patients with greater than four but less than five year follow-up.	46% 4 yrs.
43 43 38 36 36	5 patients with greater than three but less than four year follow-up.	65% 3 yrs.
31 30 30 30 27 27 24 20 18	9 patients with less than three year follow-up.	

DISCUSSION

Admittedly the number of cases available for presentation here is small, and without significance, in the statistical sense of the word, from the standpoint of survival, for they do not represent a closed series for purposes of follow-up. It is hoped that these may be added to those from other clinics for statistical analysis at a later date. Nevertheless, it would seem that there is justification in assigning some importance to the fact that of 42 patients with occult prostatic carcinoma, only 2 subsequently died of this disease. At least 65 per cent of the 26 patients alive and free from symptoms at the time of the survey had been followed for 3 years or longer.

It should be of some interest to compare these results generally with those

previously reported with various therapeutic programs in patients with proven prostatic carcinoma, but with no evidence of metastases at time of first examination (table 2).

Attention is at once drawn to several facts of interest in making this comparison. It would appear that endocrine therapy, particularly when orchiectomy and estrogens are employed, offers almost as great an oppotunity for 5 year survival as does radical perineal prostatectomy. This fact becomes even more significant when it is realized that the cases utilized for comparison in the series treated by radical surgery constitute a highly select group whose carcinoma by selection was limited to a small area in the posterior lobe, while those treated by endocrine therapy all had palpable extension of the neoplasm into the peri-

TABLE 2. *Comparison of 5 year survival with various therapeutic programs in patients with prostatic carcinoma who show no evidence of metastases on first admission*

CLINIC	NUMBER OF PATIENTS	BASIS FOR DIAGNOSIS	TYPE OF TREATMENT	PER CENT FIVE YEAR SURVIVAL
Nesbit and Plumb	273	Palpable clinical carcinoma with positive tissue diagnosis.	None (control)	22%
Nesbit and Baum	324	Palpable clinical carcinoma with positive tissue diagnosis.	Endocrine therapy Stilbestrol Orchiectomy Stilbestrol and orchiectomy	 29% 31% 44%
Colston Colby Jewett Young	38 14 78 33	Palpable small nodule in posterior lamella with positive tissue diagnosis.	Radical perineal prostatectomy	50% 35% 50.9% 50%
Thompson	112	Clinically unsuspected. Carcinoma found in tissue removed at transurethral prostatectomy.	Transurethral prostatectomy only	60.9%

prostatic tissues when first examined. The results of Thompson are superior to both the endocrine treated cases and those submitted to radical perineal prostatectomy. His cases, like those included in the present report can be regarded as within the category of "occult carcinoma".

The average age of the patient found to have prostatic carcinoma in over 2500 cases reviewed by Nesbit and Plumb, and Nesbit and Baum is 70 to 74 years. From the Metropolitan Life Insurance statistics the normal life expectancy at this age is from 7.4 to 10.3 years. These men present themselves at a period of life when they are most anxious to enjoy the fruits of existence, a period when personal comfort is paramount, and in many cases at a time when society can best benefit from the experience they may offer as a result of personal attainment in particular fields of endeavor. Are we justified therefore in

subjecting patients with occult prostatic cancer to the operative risk and the morbidity often attendant radical perineal prostatectomy in the light of present available survival statistics? No claim is made that the present comparisons are sufficient to provide the ultimate answer, but certainly the results of conservative management offer a challenge which the advocates of radical prostatic surgery must at least meet and preferably improve upon before the urologist can advise such a procedure for the treatment of unsuspected prostatic malignancy, particularly when the pathologic materials indicate the presence of neoplasm localized within hyperplasia, rather than generalized involvement of the gland.

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THE MORTALITY OF TRANSURETHRAL PROSTATIC RESECTION

C. D. CREEVY

From the Urological Division of the Department of Surgery in the Medical School, Minneapolis, Minn.

This paper has two purposes: to discuss the effect of the use of isotonic irrigating solutions upon the mortality of transurethral prostatic resection, and to compare the risk of open with that of closed operations upon the prostate.

In the former connection, two questions arise: first, does the hemolyzed blood formed in the bladder when plain water is the irrigating solution reach the circulation and, if so, does it do any harm? Anyone can easily see that the addition of water to blood makes a transparent solution, while the addition of an isotonic agent makes a translucent one, and can demonstrate with the microscope that the difference is due to the destruction of red cells in the first instance and to their preservation in the second. Therefore the use of a nonhemolytic solution during transurethral resection requires that the objective of the telescope be held closer to the object than when water is used, in order to minimize the thickness of the translucent layer, and has given rise to the complaint that it makes resection with glucose or glycine impossible. One can reply only that "there is none so blind as he who will not see."

There is incontrovertible evidence that material can pass from the bladder into the circulation during transurethral resection. First is the case of B. K., already reported, who was semistuporous and cyanotic immediately after such an operation, whose plasma was deep red 8 hours later (no transfusion had been given), and who became oliguric, uremic, and jaundiced. Autopsy revealed a typical hemoglobinuric (lower nephron) nephrosis (fig. 1).

Second, a review of sections of the kidneys of 6 patients dying after transurethral resection at the University Hospital during the years 1941 through 1945 disclosed pigmented casts in the tubules in 2 cases.

Third, measurements of the free hemoglobin of the plasma before and after prostatic resection demonstrated that, when water was used for irrigation, the postoperative was 15 times the preoperative level; this has been verified by Landsteiner and Finch, by Bunge and Barer, by Goodwin, Cason, and Scott, and by Robbins et al.; when 4 per cent glucose was used, the pre- and postoperative levels were the same. Moreover, the blood sugar at the end of operation with water in the irrigator was the same as that beforehand; with glucose the blood sugar increased about two and one half times (from an average of 81 to one of 198). This has been verified by Jessop and Lane, who found some correlation between the irrigating pressure and the extent of the rise in the blood sugar.

Next, of 109 cases resected with water, three became jaundiced when no cause other than a hemolytic reaction could be found; no case of janudice has occurred in more than fifteen hundred resections with isotonic solutions.

Next, we have found the blood culture positive at the end of transurethral

resection in 45 per cent of 350 consecutive cases (Feeney), a figure much higher than that of Biorn, and probably indicative that the resections in this series were more complete (deeper, opening more veins, and lasting longer) than those in Biorn's.

Last, Wear has shown that, if the bladder is distended by diodrast at the end of transurethral prostatic resection and an x-ray is made at once to prove the absence of reflux up the ureters, films exposed subsequently will show excretion of this agent by the kidneys (fig. 2); i.e., diodrast must have entered the circulation by way of the prostatic veins, since the normal vesical mucosa is impermeable to such substances.

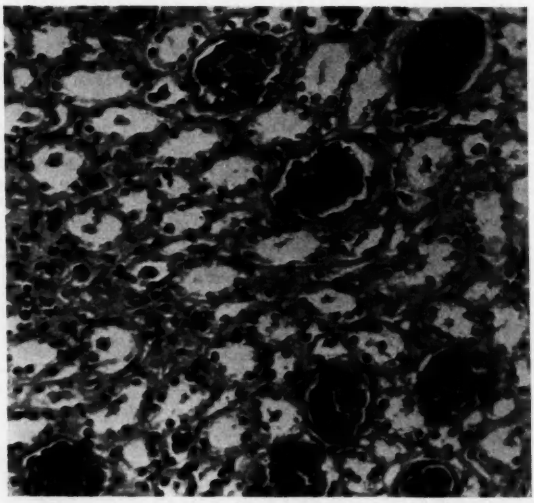

FIG. 1. Pigmented casts in patient B. K., who died following hemolytic reaction due to transurethral resection.

It has been suggested that the entrance of irrigating fluid into the cut prostatic veins can be prevented by using the irrigating fluid under a low head of pressure. This is impossible because so low a pressure would be required that arterial and venous bleeding would obscure vision completely. The use of an isotonic irrigating solution which is a poor electrolyte prevents hemolysis without complications. Four per cent glucose (Creevy), 1.1 per cent glycine (Nesbit) and 3 per cent mannitol (Goodwin, Cason, and Scott) are apparently equally effective.

Granted, then, that free hemoglobin may reach the kidneys when large veins are opened and water containing hemolyzed blood is driven into the circulation, the second question is, does it do any harm? O'Shaugnessy, Mansell, and Sloame injected 50 gm. hemoglobin intravenously into a normal adult. Despite a hemoglobinuria lasting 30 hours, renal function was not demonstrably impaired. Others have made similar observations. Solutions of hemoglobin have been recommended

for the treatment of shock, and distilled water is said to have been given intravenously without harm.* Moreover, the level of free hemoglobin required to produce severe renal damage experimentally or in blackwater fever is far higher than any observed after transurethral resection, so why worry?

This reasoning leaves out of account several important factors which undoubtedly come into play during transurethral resection. First of all, it has been shown experimentally by Mason and Mann, by Hesse and Filatov, and by Levy, that the arrival of free hemoglobin in the kidney causes severe renal vasoconstriction. Many prostatics have pre-existing renal damage,(arterio- and arteriolar-sclerosis, pyelonephritis, and hydronephrosis) often advanced, which will presumably intensify the effects of this vasoconstriction.

Further, Corcoran and Page have demonstrated transitory renal damage from the rapid loss of blood even though blood pressure is maintained above "shock"

FIG. 2. Excretion of neo-iopax absorbed through prostatic veins at end of transurethral resection.

levels; Van Slyke and others have observed impaired renal blood flow from hypotension (anesthesia, shock, hemorrhage) and have shown that protracted profound shock may cause irreversible renal damage; Trueta has made similar observations in severe experimental trauma and after stimulation of the cut end of the sciatic nerve. Franklin has pointed out that distention of the uterus, bowel, or bladder of experimental animals causes renal ischemia by shunting blood from the cortex to the medulla. This is interesting in view of the repeated distension of the bladder which ordinarily accompanies transurethral resection. All of these

* A recent experience of B. J. McGroarty, a former resident in urology at the University Hospitals, suggests that the intravenous injection of distilled water is not innocuous, at least when the kidneys have been damaged. Following a transurethral resection in a patient whose initial uremia from bilateral hydronephrosis had subsided after drainage with a catheter, 300 cc distilled water was given intravenously by mistake, which was discovered only when he had a chill and became cyanotic. The free hemoglobin of the plasma was then 280 mg. per cent, and there was a rise of urea nitrogen with mild jaundice the next day. In other words, an obvious hemolytic reaction occurred and produced measureable impairment of the renal function.

factors are presumed to cause constriction or spasm of the renal vessels, and nearly all may operate to some extent during transurethral resection so that the effect of hemoglobinemia upon the kidney may be greatly intensified.

Yuile, Gold, and Hinds have shown that a pre-existing renal ischemia aggravates the effect of intravenously injected hemoglobin upon the kidneys of experimental animals; Maluf has confirmed this in the case both of severe dehydration and of profound shock; and Goodwin, Cason, and Scott have found that old dogs and those with artificially induced hydronephrosis may suffer more severe renal injury from a given amount of intravenously injected hemoglobin than do young animals with normal kidneys. Add to these the noxious factor of bacteriemia, even though transitory, and it is easy to see how even a moderate hemoglobinemia may be the straw that breaks the camel's back insofar as the kidneys of the prostatic are concerned.

TABLE 1. *Transurethral resection in two series of 100 consecutive patients*

	FIRST HUNDRED	LAST HUNDRED
Age	62.7 yrs.	68.3 yrs.
Preoperative stay	9.95 da.	2.3 da.
Urethrotomy	0	21 %
Tissue removed	5 gm.	44.3 gm.
Per cent repeated	24	21
Carcinoma	16 %	17 %
Blood loss (smallest 0, largest 1000; over 500–9.)	—	180 cc
Hemostasis, early	2%	1%
Hemostasis, late	1%	2%
Postoperative stay	12.1 da.	10.3 da.
Mortality, per cent	4.0	0

These theoretical considerations are all very well. What about the practical proof? Table 1 gives the details of the writer's first hundred transurethral resections (before isotonic solutions) and of his last hundred ending February 2, 1950. Notable differences in the two series include the more advanced age, the shorter preoperative hospitalization, the great increase in the amount of tissue removed, and the absence of mortality in the second series. The continued high percentage of repeat operations is due to pessimism, and to unwillingness to discharge a patient with difficult micturition or residual urine. The postoperative hospital stay in the second series while shorter than in the first, is longer than that reported by many others chiefly because of the high proportion of two stage operations, and because nearly all of the patients come from out of the city.

More significant than these figures is table 2 which gives, among other things, the mortality of transurethral resection in a thousand consecutive cases done by the writer and his two former associates (Drs. E. A. Webb and B. A. Smith, Jr.) since the adoption of isotonic irrigating solutions. The mortality of 0.6 per cent is about as low as one can rightfully expect in operations upon elderly men; it seems reasonable to suppose that the difference between this mortality and that of the others shown in the table is due to the use of isotonic irrigating fluid.

TABLE 2. *Mortality of operations upon the prostate*

AUTHOR	YEAR	TYPE	CASES	MORTALITY
				Per cent
Nesbit	1946	TUR	2425	1.81
Thompson	1948	TUR (punch)	11,522	1.20
Creevy, Webb, Smith	1950	TUR	1000	0.60
Total			14,947	1.29
Residents, U. of Minn.	1950	TUR	560	2.50
Whole Series, U. of Minn.	1950	TUR	1560	1.20
Young	1926	Perineal	1000	3.20
Barney	1936	Perineal and SP	816	14.20
Hunt and Walters	1938	Suprapubic	1000	5.40
Millin	1949	Retropubic	757	4.50
Total			3573	6.60

TABLE 3. *Mortality of enucleation of prostate, 1945–1949*

Esersky and Greenberg	1945	SP	50	1
Zimmerman	1946	SP	51	2
Rees (England)	1947	SP	242	23
Rees (England)	1947	P	45	4
MacDonald (Canada)	1947	SP	495	39
Morville (Denmark)	1947	RP	20	2
Brunner (Switzerland)	1947	RP	51	2
Stock (England)	1947	SP	40	1
Derycke (Belgium)	1947	RP	22	1
Goldstein	1947	P	36	1
Eikner	1948	SP	89	1
Treiger et al.	1948	SP	108	9
McCrea	1948	SP	100	4
Grant, Lich et al.	1948	RP	65	0
Lowsley et al.	1948	RP	20	0
Galbraith (England)	1948	SP	318	12
Ward (England)	1948	VC	50	2
Walters (England)	1948	ASP	115	9
Jacobs (Scotland)	1948	RP	205	15
Bacon	1949	RP	102	7
Weijlandt (Holland)	1949	RP	60	3
Higbee	1949	P	336	6
Presman and Rolnick	1949	RP	40	3
Total			2760	147
Operative mortality				5.3%

In any case, the table shows a mortality of 1.29 per cent in a total of 14,947 patients from three sources subjected to transurethral resection with and without nonhemolytic solutions.

Contrast this with the mortality for the various open operations shown below: 6.6 per cent in 3573 cases. This invidious comparison is prompted by recent statements here and there in the literature to the effect that the mortality of the open operations is now no greater than that of transurethral resection, and citing a small series of cases in support of this contention, although every surgeon of experience knows that the mortality of a small series may, owing to the operations of chance, be quite different from that in a large group, in which chance variations are necessarily smaller. It is conceded that the series of retropubic prostatectomies of Millin is the only large one reported since the advent of antibiotics, improved methods of anesthesia (most of our cases were done with old fashioned spinal), and the free use of transfusion, but no other recent large series of open operations has been found. It has, however, been possible, by culling many smaller series from the literature between 1945 and 1950 to collect 2435 open enucleations (table 3). Notwithstanding the fact that several of the authors reported small groups without deaths, the overall hospital mortality was 5.3 per cent, and this since the advent of antibiotics, widespread use of transfusion, and "modern methods of anesthesia".

The five hundred odd cases done by the residents at the University Hospitals since the adoption of isotonic irrigating fluid are listed separately, not to make the mortality of the other series lower, but to point out that men learning transurethral resection with nonhemolytic solutions on patients who are, on the average, very poor risks, achieve a mortality lower than that ordinarily attained by many experts with the open operations.

SUMMARY AND CONCLUSIONS

Free hemoglobin formed in the bladder by contact between blood and the water used as irrigating fluid during transurethral prostatic resection may be driven into the circulation when large prostatic veins are opened.

When this free hemoglobin reaches the kidneys, renal vasospasm results and may lead to severe or fatal renal damge, particularly in the presence of rapid loss of blood, hypotension, bacteriemia, or pre-existing renal damge.

This reaction is prevented by the use of an isotonic irrigating solution (glucose, glycine, mannitol), thereby lowering the morbidity and mortality of transurethral resection of the prostate.

A series of 1000 consecutive cases in which transurethral resection was done with glucose and glycine as the irrigating solutions is reported, the surgical mortality being 0.6 per cent.

The mortality of transurethral resection is far below that thus far reported for any of the open methods of enucleating the enlarged prostate.

The statement that the mortality of open enucleation of the prostate is no greater than that of transurethral resection (if well done) is not warranted up to the present time.

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DISCUSSION

Dr. Vincent J. O'Conor (Chicago, Ill.): I think that Dr. Creevy has proven his case; at least, he has to me. I am astounded, in going around the country, to see my colleagues still using sterile water as the irrigating agent in doing transurethral resection.

I had a recalcitrant member of my own group who refused to go along with the other four of us on our service and who continued to use sterile water for his resections. He is now a convert to 1.1 per cent glycine solution, which the rest of us use, because he has had 2 deaths, definitely proven at autopsy, at least to our satisfaction, to be due to lower nephrosis and tubular damage with hemolyzed blood.

There is a point that I would like to make with regard to irrigations during transurethral resection which I have not heard mentioned and which I believe I myself missed until we had three instances of it during the past 2 years; that is, the recognition of how you can over-hydrate a patient during a transurethral resection. That was forcibly brought to my attention in three instances, two of which operations were done by my associate and one by myself. We had very adequate cardiac and preoperative studies on these patients to show that their cardiac condition was very suitable for operation. The patients went through a fairly prolonged resection without undue bleeding but where, suddenly, about the time when they were removed from the table, they developed a very rapid pulse, became quite ashy gray, but instead of the blood pressure going down, it went up.

The first time this happened, I was at a loss to explain it; as a matter of fact, I thought that the patient had probably had some sort of an embolic reaction. All three of those patients, with medical consultation, were returned to bed with suitable cardiac attention, and none of them received any fluids for the first 12 hours' postoperative period. All three of them received a total of 1000 cc 5 per cent glucose in saline during the first 24-hour period, and each one of those patients put out over 4000 cc of urine during this period.

It struck me forcibly that we can fill these patients so full of fluids through their prostatic bed during the transurethral resection that we may place a dangerous overload on the cardiac capacity.

Dr. William J. Baker (Chicago, Ill.): In our city, this effort to reduce prostatic mortality has become so great, that in two centers, they will not operate a prostatic patient unless he can walk eight blocks.

I would like to ask Dr. Creevy if he operated on all prostatic patients as they came along, or whether he excluded some of them?

Dr. Leon Herman (Philadelphia, Pa.): May I ask Dr. Creevy what preoperative medication was given to support blood pressure following operation? Did he have ephedrine, or what?

Dr. Creevy: No, all of them had low spinal anesthesia, and I think most of them get some sort of narcotic with atropine.

Dr. Herman: Any vasomotor stimulant?

Dr. Creevy: No, sir.

DR. HERMAN: We have had serious delayed reactions an hour later or an hour and a half later, as a result, we think, of the use of vasomotor stimulants.

DR. DAVID M. DAVIS (Philadelphia, Pa.): Is this the proper time to discuss the question of mortality, Mr. Chairman, or should one wait until after the next series of papers?

PRESIDENT COLSTON: I think that now is as appropriate as any other time, Dr. Davis.

DR. DAVIS: I think we have to pull ourselves together on this question of mortality following prostatic operations. I was quite impressed with the discussions at Barcelona this summer at the International Urological, which were entirely carried on by people who were not from this country. I think Dr. Smith said a few words about prostatic operations, but otherwise we did not participate.

The best mortality percentage reported by anyone at that meeting was 4 per cent, and several reported, without any signs of embarrassment, mortality rates considerably higher than that.

The fact of the matter is that we now have at our disposal many methods of operating upon the prostate. We have a very great knowledge of the physiology of the entire body, the fluid exchange, the exchange of crystalline substances and electrolytes, the necessity for proper restoration of blood loss; we know a great deal about kidney function, and we know a great deal about cardiovascular disease and how to handle it. We know that many people, like Dr. Creevy, for example, with his last hundred cases, are able to operate upon prostates with an exceedingly low mortality. In other words, we are dealing with a situation where the mortality should be very low, and for that reason we are not justified, ever, in taking any chance whatever with any single patient which we can possibly avoid.

I am inclined to think that we must look at it from that point of view. We must forget our enthusiastic advocacy of any particular type of operation or any other procedure. We must ask only, What are the results?

To illustrate with a few points, there seems to be no question, as I can make out from published papers and from conversation with many people who have done resections, that the occurrence of hemolysis and lower nephron nephrosis is much greater in those cases where it is seen at the time of operation that the venous sinuses of the prostate have been opened. I submit that in order to get a good result, it is not necessary to open the venous sinuses of the prostate. If one proceeds to open the venous sinuses merely to be sure of having his operation radical and complete, one subjects the patient to a risk which is unnecessary and unjustifiable. It is much better to repeat the resection than it is to open the sinuses.

In the same way with those who perform open operations, there is no doubt in the world that good results can be obtained with suprapubic prostatectomy, with retropubic prostatectomy, and with perineal prostatectomy. Therefore, we should put aside our prejudices and select, adopt, and use the method which has the lowest mortality. We are certainly not justified in taking any other course.

We are not justified in taking a chance in operating upon a patient whose

condition is known to be unsatisfactory in other respects. Certainly, it is better, in my estimation, to lean over backwards and to supply, when indicated, suprapubic drainage for a period of weeks or months, in order to restore kidney function, to allow the ureters to return to their normal size and normal peristaltic function, because by so doing, the mortality will be reduced, and if you save only one case out of a hundred, you have to consider that nowadays a single unnecessary death may double your mortality for a year.

I have no statistics which I can show in the form of a table. I have to rely on my memory. But I can say to you definitely that my own personally operated cases, which, in the effete East, do not reach the stratospheric numbers that they do in the West—probably, let us say, between four and five hundred—have been carried out without mortality; in other words, the last patient who died was in 1943. These have included transurethral resections, perineal prostatectomies, suprapubic prostatectomies, and one retropubic prostatectomy.

I present these considerations to you. I do not believe that properly conducted open operations should have or do have anything like a 4 or 5 per cent mortality. If the mortality in my clinic rose to 4 per cent, I would be horrified and I would know that something was very wrong.

Dr. George R. Livermore (Memphis, Tenn.): May I ask Dr. Creevy if he noted any difference in the height to which he puts the irrigating can since using glycine?

Dr. C. D. Creevy (Closing): I neglected to mention that three of us have done and sent home 87 more patients without an additional death since this series was concluded. This makes a fractional difference in the mortality.

In reply to Dr. O'Conor's question about the amount of fluid that may be absorbed, one could actually measure it. One of our patients who had a normal blood sugar at the beginning of operation had 1008 mg. per cent at its end. Making no allowance for the utilization of glucose or for its excretion during the period of the operation, he must have absorbed more than a liter of 4 per cent glucose, so that that is an avenue by which a considerable volume of unwanted fluid may enter the circulation.

I wanted to say something, too, about the effect of intravenous distilled water, but I did not want to take the time in my paper. One of my former residents who is practicing in St. Paul did a transurethral resection on a patient with bilateral hydronephrosis who was uremic on admission, but whose urea nitrogen had come down to 20 on catheter drainage, forced fluids, and antibiotics. Through a misunderstanding, he received 300 cc of distilled water intravenously immediately after operation. He became cyanotic, his blood pressure dropped, he had a chill, his plasma hemoglobin rose to 280 mg. per cent, and next day he was mildly jaundiced, with an elevated urea nitrogen. This is just another bit of evidence showing what intravenous distilled water can do. But you can inject quite a sizable quantity of distilled water into a normal animal without renal damage and apparently get no ill effects from it.

Dr. Baker asked about the exclusion of cardiacs or other poor risks. Nobody has been excluded. If the poor risks have complicating disease, particularly

cardiac disease, an internist always sees the patient, and the operation is not done until he feels satisfied that the patient's condition can not be improved. If it is obvious that it is going to take a long time for the renal function to improve, and if the patient has a high-grade retention, he has a cystostomy with the Kreutzmann trocar. In my experience, this is an extremely benign procedure. It is always dangerous to base any statistics on one's recollections without looking at the records, but I can't recall anyone having been killed by a trocar cystostomy at the University Hospital.

Somebody mentioned the use of vasoconstrictors before operation. He touched upon a very sore point. I have carried on a struggle with our physician anesthetists over a period of 10 or 15 years, trying to convince them that they should let me worry about the blood pressure in prostatic operations, and that they must not under any circumstances give vasoconstrictors without asking me first. Our average patients get no ephedrine, no neosynephrine—nothing to sustain the blood pressure except fluid intravenously. I have seen the pressure go as high as 300 from the injection of ephedrine during the course of the operation, and on one occasion I had to take all the stitches out of a perineal prostatectomy and start all over again because the professor of anesthesia slipped in and gave the patient some ephedrine intravenously just as I had finished closing up the capsule. I believe that this is a vicious practice.

With Dr. Davis' statement that we should not open the venous sinuses, I disagree completely. If one uses isotonic solution, and antibiotics, and knows how to control the bleeding, I can see no objection whatever to opening the venous sinuses, nor do I think that anyone can do a really satisfactory transurethral resection on a large prostate without getting into some of the sinuses.

I have heard it said that isotonic irrigation solutions are unnecessary. Stop the operation and finish it another time if sinuses are opened. This seems to me a very weak-kneed solution to the problem. It is better to use isotonic irrigation fluid and finish the operation. I don't believe that opening the sinuses does any harm unless an uncontrollable hemorrhage is produced—a very rare event indeed with the experienced resectionist.

TECHNIQUE OF RETROPUBIC PROSTATECTOMY

EDGAR BURNS

From the Department of Urology, Ochsner Clinic and the Division of Urology, Tulane University of Louisiana, School of Medicine, New Orleans, La.

The original technique of retropubic prostatectomy and its various modifications have all been described in the medical literature. The complications arising in some cases and the poor end results obtained in others are not necessarily the fault of the method, but might be attributed in some cases to its improper application. The retropubic operation, like any other surgical procedure, must be correctly performed if a good result is to be obtained. Proper selection of cases, together with careful handling of the various structures involved in performing the operation, will largely prevent many of the criticisms now directed toward this method of treatment of vesical neck obstruction. After adequate trial with retropubic prostatectomy, we are now using the method for removal of large, benign prostatic hypertrophies and a modification of it for obstruction at the vesical neck in children. Our discussion will be confined to a description of the technical procedures for removal of obstructions produced by these two lesions.

LARGE BENIGN PROSTATIC HYPERTROPHY

The important structures involved in the retropubic operation for benign prostatic hypertrophy are the precapsular veins, true and false prostatic capsules, the adenoma and the prostatic arteries. Errors in handling these structures account largely for the difficulties encountered in performing the operation.

As a result of a wide experience with more than a thousand cases of retropubic prostatectomy, Millin has made technical modifications which appear to offer more ease of performance, fewer postoperative complications and better end results than any other suggested changes in his technique. We believe that for best results his present technique should be carefully studied and closely followed. There are a number of important points, which might be desirable to discuss here.

1. Elevation of the pelvis suggested by Rolnick (fig. 1, *A*) facilitates exposure by bringing the neck of the bladder to a higher level in the pelvis. Adequate space can be provided by a transverse incision (fig. 1, *B*) a fingerbreadth above the symphysis pubis with separation of the recti; this type of incision leaves a strong abdominal wall.

2. It is important to dispose of the precapsular veins gently but adequately. The size and number of these veins vary in different individuals. The smaller ones may be handled by clamp and electrocoagulation but the larger ones should be ligated. Because of their thin walls the ligatures will frequently cut through. To avoid this the needle should be passed beneath the vein and it should include some of the superficial layers of the fibrous capsule, and the ligature should be tied over a small fat pad, as indicated in figure 1, *C*.

3. A small gauze pack introduced in the lateral fossa will enlarge the exposure in most cases. If it is used it should be inserted lightly and removed before enucleation is begun. Placing the packs too deeply and allowing them to remain during enucleation may possibly account for obturator neuritis.

4. Two traction sutures are inserted into the prostatic capsules, one 0.5 cm. and the other 1.5 cm., below the vesical neck and the ends left long. These are used for traction of the capsule during enucleation and for supplementary closure after enucleation has been completed. A transverse incision is made in the capsule starting on the right lobe and extending across half way between the two traction sutures onto the left lobe or a centimeter below the vesical neck (fig. 1, *C*). The length of this incision will vary according to the size of the prostate and should be long enough to permit delivery of the prostate without

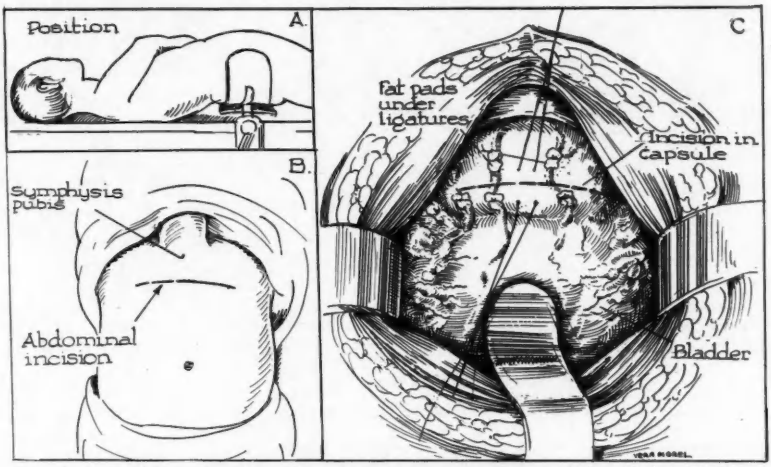

FIG. 1. *A*, position of patient for retropubic prostatectomy. (After Rolnick.) *B*, transverse incision is made a fingerbreath above symphysis pubis. *C*, veins ligated over small fat pad to avoid ligatures cutting through thin walls.

laceration of the capsule. The importance of making this incision deep enough to go through the true and false capsules and even into the adenoma should be emphasized (fig. 2, *A*). An incision of insufficient depth may lead to an attempt to start the enucleation between the true and false capsules and result in troublesome bleeding. Not infrequently an artery can be seen spurting from the center of the upper and lower flaps. This should be controlled by suture or coagulation. The venous oozing from the cut margins of the capsular flaps is usually unimportant but if necessary it may be controlled by T-clamps until the capsule is sutured.

5. The apex of each lateral lobe is then separated from the capsule by means of curved scissors (fig. 2, *B*, *C*) and the prostatic urethra is severed at the apex (fig. 2, *D*). It is important to sever the urethra partially or completely during this maneuver in order to prevent undue traction on the membranous urethra

during the attempt to free the apex of the adenoma. This may lead to temporary or even permanent incontinence. This point was not strictly observed in one of

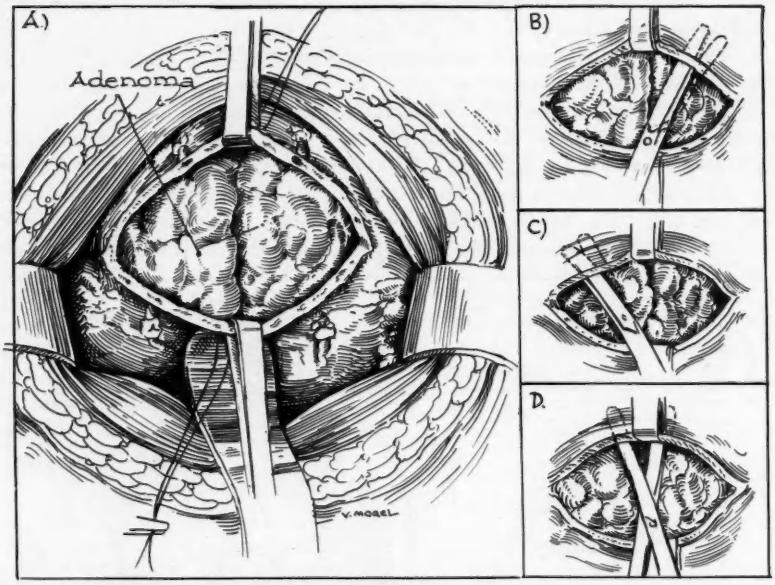

FIG. 2. *A*, incision in capsule visualizing the adenoma. *B*, *C*, apex of each lobe is separated from capsule by means of curved scissors. *D*, prostatic urethra is severed at apex.

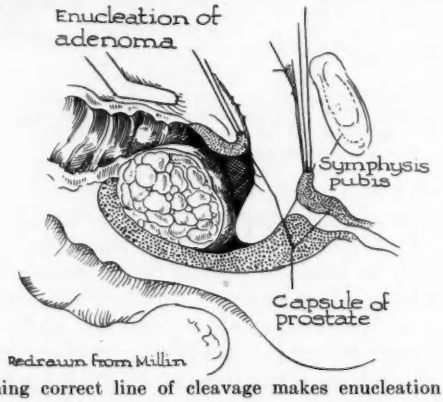

FIG. 3. Establishing correct line of cleavage makes enucleation easier with normal amount of trauma.

our cases and traction was put on the urethra in freeing the apex before the error was recognized. The patient had total incontinence for a few days and partial incontinence for 3 weeks.

6. Gentleness is of utmost importance in performance of the enucleation

(fig. 3). A traumatizing procedure may tear the capsule, resulting in unnecessary bleeding, which may be difficult to control, and this may predispose to drainage of urine through the wound and other postoperative complications.

7. Adequate hemostasis is as important in this as in other types of prostatic surgery. The prostatic arteries can be easily visualized and ligated with transfixion sutures (fig. 4, *B*). Venous oozing is rarely of clinical importance and usually stops when the prostatic capsule contracts. We have not found it necessary to use a hemostatic bag or pack hemostatic agents into the prostatic cavity to control bleeding.

8. After hemostasis is complete, the prostatic cavity should be carefully inspected for small adenomas or tags, all of which should be removed, and the cavity left perfectly smooth.

9. In the majority of cases the posterior lip of the vesical neck is elevated and a generous wedge should be removed from this area (fig. 4, *A*). Bleeding that results from removal of this wedge should be controlled by spraying with a fulgurating current or by sutures.

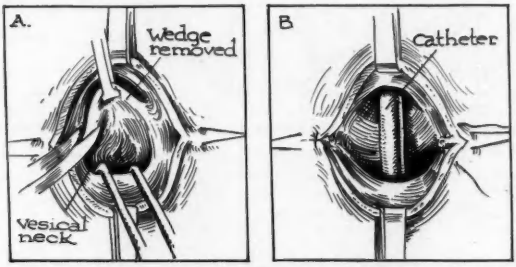

FIG. 4. *A*, generous wedge is removed from posterior lip of vesical neck. *B*, ligation of prostatic arteries with transfixion sutures and placing of retention catheter in bladder.

10. The retention catheter should not be too large—in the majority of cases, not larger than a 20 or 22F. Larger catheters are not only uncomfortable but may predispose to the development of strictures. The catheter is guided through the vesical neck to a proper position in the bladder. If a Foley type of catheter is used, the bag should be sufficiently distended to prevent slipping down into the prostatic urethra, in which case drainage is inadequate and urine will leak through the wound.

11. The capsule is closed by a continuous layer of No. 1 chromic catgut sutures (fig. 5). The traction sutures are then tied for further support of the closure. We have discontinued using the boomerang needle to suture the capsule and now favor the small, full curved needle, which appears less traumatic. The capsular suture should be hemostatic as well as water tight. At this point in the operation the space of Retzius should be perfectly dry. If any oozing exists, this may be controlled by a light pack, which is brought out through the wound and removed at the end of 24 to 48 hours. The abdominal wound is closed in layers and the Penrose drain is left in the space of Retzius for 4 or 5 days or until the dressing has remained dry. Particular care is exercised throughout the operation

to avoid trauma to the periosteum. An injured periosteum exposed to an accumulation of infected urine in the space of Retzius is considered to be a chief predisposing factor to osteitis pubis. For this reason, we believe that the space of Retzius should be drained for a longer period than is practiced at the present time. The patient may be out of bed at the end of 24 to 48 hours and if there is

FIG. 5. Closure of capsule by continuous layer of No. 1 chromic catgut sutures

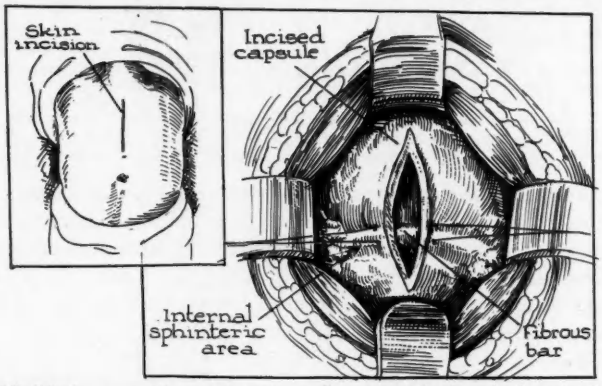

FIG. 6. Modified retropubic prostatectomy for removal of vesical neck obstruction in children. Incision made just above internal sphincter and extended through vesical neck and distally as far as necessary to expose prostatic urethra. Inset shows cutaneous incision.

no leakage of urine the catheter may be removed at the end of 4 or 5 days. Stones in the bladder or lower ureter may be removed at the same time retropubic prostatectomy is performed without complicating or prolonging the postoperative period.

VESICAL NECK OBSTRUCTION IN CHILDREN

We have utilized a modification of the retropubic operation for removal of vesical neck obstruction in children. A longitudinal abdominal incision is ex-

tended from the upper margin of the symphysis pubis upward for a distance of 5 to 7.5 cm. (fig. 6). The vesical neck is exposed; an incision is made just above the internal sphincter and extended through the vesical neck and distally as far

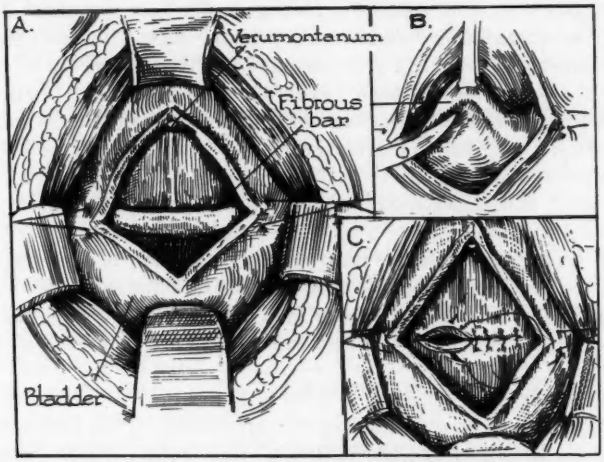

FIG. 7. *A*, exposure of entire prostatic urethra to full view. *B*, excision of obstruction. *C*, closure of defect created by removal of obstruction.

FIG. 8. Cystogram showing a decompensated upper urinary tract requiring suprapubic drainage.

as is necessary to expose the entire prostatic urethra to full view (fig. 7, *A*). It may be carried through the entire length of the prostatic urethra but this is rarely necessary. Congenital bars are excised under vision (fig. 7, *B*) and the raw surface thus created is covered by approximating the cut edges with inter-

rupted sutures. Prostatic valves may be destroyed by electrocoagulation. The loss of blood is usually minimal and bleeding points are dealt with individually. A catheter is inserted through the urethra and the incision in the capsule and bladder is closed with continuous sutures (fig. 7, *C*). This completes hemostasis and leakage of urine rarely occurs. The catheter should be left in until the wound appears healed, usually 7 to 10 days. In those patients whose upper urinary tract shows severe damage a stab wound is made high in the bladder and suprapubic drainage is instituted (fig. 8). This should be continued until the upper urinary tract has had a maximum opportunity to regain its function, usually 6 months or more.

We have used this method in 9 cases with no deaths, no significant postoperative complications and uniformly satisfactory end results. From this brief experience it is our belief that this method may completely replace transurethral resection for removal of vesical neck obstruction in children. Lich and Maurer reported uniformly satisfactory results in 5 cases in which this method was used. There are probably others which have not yet been reported.

SUMMARY

We prefer Millin's technique of retropubic prostatectomy for removal of large, benign prostatic hypertrophy. The details of this technique are described and illustrated.

A modification of the retropubic operation, which is described in detail and illustrated, has been used in 9 cases of vesical neck obstruction in children with no deaths, no significant postoperative complications and satisfactory end results. It is our opinion that this method may entirely supplant transurethral resection for removal of obstructions at the vesical neck in children.

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INDICATIONS FOR RETROPUBIC PROSTATECTOMY

CARL RUSCHE

The subject of the surgical approach to the prostate is a very trite one. Numerous articles and treatises have been written about it for decades, yet the difficulties of removal of the prostate gland remain.

Mr. Terence Millin's method of extravesical prostatectomy has been received in this country and abroad, with considerable enthusiasm. It is his belief that retropubic prostatectomy is the most universally applicable operation yet devised to eliminate the evils of the obstructing prostate, and that it is suitable for all types of prostatic obstruction.

The experiences of a relatively large number of authors indicate that Millin's retropubic operation is extremely simple, and is attended by few serious complications, with comparatively little mortality provided his operative procedure is carefully employed and good hemostasis is obtained at the time of surgery. The beneficial features are:

1) The operative field is amply exposed so that all stages of the procedure are performed under direct vision.

2) There is no injury to or interference with any vital organ.

3) The urinary bladder is not opened, thus reducing operative shock, avoiding the inconvenience of delayed healing and lessening the chance of a persistent fistula. Almost always the wound heals by primary intention.

4) The adenomatous prostate is completely enucleated and the bladder orifice is well exposed so that a subtrigonal lobe may be readily removed.

5) The mortality rate is low.

As a result of my experiences, I have found that the retropubic operation is comparatively free from risks and complications encountered in the removal of the prostate by other approaches; however, some of the complications include the following: 1) primary hemorrhage, 2) secondary hemorrhage with pericystitis and suppuration, 3) postoperative urinary fistula, 4) osteitis pubis, and 5) impotence.

Generally speaking, I believe the transurethral approach is the method of choice in the small prostate, the fibrous bar at the bladder neck, or for palliation in prostatic cancer. Perineal prostatectomy is usually preferred in cases of early prostatic carcinoma, prostatic calculosis and in the poor risk patient with marked renal insufficiency.

I have only performed radical retropubic prostatectomy on two occasions, and although I tried to follow the technique described by Millin as closely as possible, I found it extremely difficult to suture the vesical neck to the urethral stump. In order to draw the bladder neck to the urethra, it was necessary for me to rely on tension with a Foley catheter for approximation. The postoperative course of one patient was entirely without complications; the other developed symptoms associated with osteitis pubis. This experience has deterred me, temporarily at least, from further use of the method of radical retropubic prostatectomy.

Millin has devised a unique surgical procedure for the removal of the prostate gland, and it has proved to be a valuable addition to our armamentarium in the treatment of prostatism. However, I have had no occasion to change my conviction that the method of prostatectomy should be adopted to meet the needs of the patient, not the patient forced to conform to the limited skill of the surgeon.

1680 N. Vine St., Hollywood 28, Calif.

RETROPUBIC PROSTATECTOMY: RESULTS AND COMPLICATIONS

THOMAS D. MOORE

From the Department of Urology, John Gaston Hospital, College of Medicine, University of Tennessee, and the Moore Clinic, Baptist Memorial Hospital, Memphis, Tenn.

In 1945 Millin first utilized the extravesical retropubic approach for prostatectomy and the same year described his technique and reported his experience in 20 cases. Since then a sufficient number of retropubic prostatectomies have been performed in this country and abroad to indicate that the procedure has established itself as one of merit and one which will undoubtedly be used extensively, although hardly sufficient time has elapsed to permit a true evaluation of the late results of the operation.

The material for this discussion of results and complications comprises 116 cases in which more than a year has elapsed since the operation. Sixty-seven of this group were from private practice and forty-nine, largely charity cases, were from the urologic service of the John Gaston Hospital, College of Medicine, University of Tennessee, including those operated upon by my associates and the resident staff. Of the entire group it has been possible to tabulate the results in 60 of the private cases and in 27 from the charity service, a total of 87. A recent survey revealed that 14 patients could not be traced and that 15 have expired from various causes since they were dismissed from the hospital.

In arriving at the merits of any surgical procedure due consideration must be given the immediate and remote functional results, the incidence of complications, morbidity and the mortality rate. A critical review has been made of the clinical records of these patients and data pertaining to late results have been obtained both through personal observation and from the submission of a questionnaire. While the latter method of obtaining information is not altogether satisfactory, it provides a means of securing data which otherwise would not have been available as many of these patients live at distant points and found it impractical to return for examination. The questionnaire sought specific information regarding the state of the general health, gain or loss of weight, sexual power, urinary difficulty, bladder function, urinary control, nocturia, hematuria, pyuria, pyelonephritis, pain or discomfort in the region of the pelvis or thighs and there was a request for any general remarks the patient might care to include.

Inasmuch as results and complications may be directly related to the choice of cases and the considered indications for an operation, it may be stated that this series is limited to those in which the large size of the gland was such that enucleation seemed preferable to removal in small segments transurethrally. The rule has been adopted that if the necessity of removing 50 or more grams of tissue is anticipated, prostatectomy by some method of enucleation is preferable to transurethral resection. In our experience about 75 per cent of cases of benign hyperplasia of the prostate, associated with obstructive symptoms of such degree as to warrant surgical interference, have been dealt with very satisfactorily by

transurethral resection and about 25 per cent have been subjected to open operation and enucleation of the adenofibromatous mass. There has not been included in this series any instances of known carcinoma of the prostate although in six of the cases which were considered clinically of benign character, the pathologic diagnosis was adenocarcinoma. It might be stated further that early in our experience with retropubic prostatectomy a very favorable impression was gained of the operation which prompted us to adopt this procedure in preference to suprapubic prostatectomy and as a result very few glands have been enucleated suprapubically, either by the one- or two-stage methods since we performed the first retropubic prostatectomy three years ago. The immediate and late results of the operation have been observed with the keenest interest and it may be frankly stated at the present time that although some serious complications have occurred, they have been relatively infrequent. Disadvantages are so far outweighed in the rank and file of cases by such advantages as the marvelously short and smooth convalescence, excellent functional results and remarkably low mortality rate, that we have felt justified in continuing to use the procedure.

REVIEW OF CASES

Age. The age of the patients in this series varied from 50 to 86 years and the average age was 69.5 years. Eighty-three of the patients were between 60 and 79 years and there were ten 80 years or more of age. Most of the infirmities usually seen in geriatic practice were encountered and the usual safeguards pertaining to the preliminary clinical study, preparatory treatment and postoperative care were routinely observed.

Size of gland. An estimate of the size of the obstructing prostate was obtained through a combination of the digital examination and pneumocystography. Cystoscopy was employed in very few of the cases although it undoubtedly would have provided a more accurate estimate of the size of the gland. It has been our feeling, however, that preliminary cystoscopy, in the presence of a large obstructing prostate, incurs a definite and unnecessary risk and should be avoided whenever reasonably possible unless some unusual and important indication presents itself. In this group the average weight of the glands removed was 75.6 gm. The largest gland weighed 250 gm. and there were 12 which weighed 30 gm. or less. No doubt, all the latter could have been dealt with very satisfactorily by transurethral resection but their size had been overestimated in the preliminary clinical investigation.

Technique. In all of the cases a low transverse incision has been used with division of the sheath of the recti, separation of the muscles in the midline and their gentle retraction. In the first 36 retropubic prostatectomies the larger veins comprising the plexus of Santorini were grasped with hemostats and electrocoagulated. In the remainder of the group the prostatic capsule has been incised between hemostatic sutures employing an ordinary scalpel, whereas formerly the capsule was divided with the electric scalpel. These details are mentioned because the impression has been gained that certain late complications may

possibly be related to such seemingly minor technicalities. All in all, the technique of the operation as described by Millin has been followed fairly closely including the greatest care in the preliminary toilet of the bladder, careful suturing of the prostatic capsule with the view of attaining a watertight closure, the scrupulous avoidance of trauma to the pubic bone or its periosteum, the excision of a v-shaped segment from the posterior margin of the vesical neck, good visualization of the prostatic cavity with extreme care regarding hemostasis, the employment of the sulfonamides and antibiotics, the early removal of the postoperative inlying catheter, usually by the third day, and, lastly, early ambulation.

Immediate results. Inasmuch as this discussion is concerned primarily with late results and complications, only brief mention will be made of the immediate postoperative course. As a rule, these patients are remarkably free from shock and are definitely more comfortable than is observed when the bladder has been opened suprapubically. The degree of postoperative hematuria compares favorably with that seen in the usual transurethral resection when good hemostasis has been attained. In most cases by the third day drainage is usually clear or only slightly discolored and the catheter is removed, after which the patient is allowed to be up and about. In the immediate postoperative period there were 9 instances of infection involving the incision, none of which was serious, and the remainder healed per primam. In the group of private patients, the period of postoperative hospitalization varied from 7 to 31 days, averaging 10.6 days.

General health. Definite improvement in the general health was reported by 77 patients (88.5 per cent) and no change in general health by 10 (11.5 per cent).

Weight. Forty-nine patients (56.3 per cent) reported gain in weight and in one instance this amounted to 43 pounds within 17 months following operation on a diabetic 75 years of age. Thirty-one (35.6 per cent) reported their weight unchanged, in 4 (4.5 per cent) there had been loss of weight and in 3 there was no report.

Sexual power. Data regarding sexual power are of interest inasmuch as variable effects have been noted, depending upon the approach adopted in prostatectomy. It is generally known that sexual power is usually diminished following perineal prostatectomy and this has been listed by numerous writers as one of the objections to the procedure. In this group sexual power was reported definitely improved by 11 patients (12.6 per cent), was unchanged in 61 (70.1 per cent) and diminished in 5 (5.7 per cent). There is reason to believe that deleterious effects in this regard are less following retropubic prostatectomy than in any other surgical approach to the prostate gland.

Bladder function. Bladder function was reported satisfactory by 86 patients (98.8 per cent) and unsatisfactory by 1 (1.2 per cent). In this case there was a heavily infected vesical diverticulum with nocturia of 3 to 4 times in a patient 88 years of age who survived a secondary retropubic prostatectomy fifteen months. Eight-two patients (94.2 per cent) reported no urinary difficulty; 5 (5.8 per cent) reported recurrence of urinary difficulty, in 3 of whom it was of mild degree and of no consequence; in 1 there was definite evidence of carcinoma of the prostate with metastases 13 months postoperatively and in another case

there was moderate contracture of the vesical neck but no residual urine twenty months following operation.

Urinary control. Urinary control was reported normal by 76 of the patients (87.4 per cent). Slight terminal dribbling was reported by 11 (12.6 per cent). There was not one instance of urinary incontinence.

Nocturia. The degree of nocturia may be considered an index to the functional result in a given case. By referring to table 1 it is noted that 17 patients (19.4 per cent) reported no nocturia and in 78 (89.6 per cent) there was nocturia of only none to three times.

Other data. The urine was reported clear by 73 patients (84 per cent) and cloudy in variable degrees, usually mild, in fourteen (16 per cent). Pyelonephritis as a late complication did not occur, although 4 patients reported fever of moderate degree, one from epididymitis 18 months postoperatively. In two others fever was associated with osteitis pubis and in another case it was caused by a stitch abscess one year following operation.

TABLE 1. *Incidence of nocturia following retropubic prostatectomy*

None	17	(19.4%)
0 to 1	20	(22.7%)
1 to 2	27	(31.2%)
2 to 3	14	(16.7%)
3 to 4	3	(3.5%)
4 or more	6	(6.8%)

COMPLICATIONS

Epididymitis. Formerly vas ligation or partial vasectomy was performed routinely in the surgical treatment of prostatic obstruction. With the advent of modern chemotherapy and the antibiotics, the impression was gained that their use routinely in the preliminary and immediate postoperative periods would prevent epididymitis and the practice of ligating or sectioning the vas was abandoned. In the group under discussion there was no interference with the vas in 59 cases, among which epididymitis occurred in 6. None of these progressed to suppuration, however, nor did any require epididymotomy. In the group subjected to ligation or vasectomy there were 2 instances of acute epididymitis. At present, reliance again is placed upon chemotherapy and the antibiotics for the prevention of epididymitis.

Hemorrhage. Late secondary vesical hemorrhage occurred in 7 cases (8 per cent), in 3 of which it would be considered severe, requiring one or more blood transfusions. In three there was gross hematuria of lesser degree, in one on the seventh postoperative day and in two others on the fourteenth and thirty-fifth postoperative days, respectively, but of a degree easily controlled by re-insertion of a Foley catheter and clearing the bladder of clots.

Persistent or recurrent urinary difficulty. Following the enucleation of a large benign prostate by any standard technique, the persistence or return of urinary difficulty is always a matter of concern. It may be due to vesical atony, contracture of the vesical neck, a stricture of the urethral meatus, adenomatous remnants in the prostatic fossa, or to recurring obstruction from carcinoma.

Early recurrent obstruction occurred 5 times in Millin's first 75 cases (6.6 per cent). Since he adopted almost routinely the excision of a wedge from the posterior margin of the vesical neck, the complication occurred in only 3 cases out of 675 (.44 per cent). Wilhelm and Freed reported stricture of the neck of the bladder in 9 cases out of 33 retropubic prostatectomies. In this series of 116 there were 3 instances (2.5 per cent) of vesical neck contracture. Two of these occurred in spite of the fact that a v-shaped segment had been excised from the posterior margin of the vesical neck. In one this had not been done. Recurrent urinary difficulty reported by two other patients was found to be due to a stricture of the urethral meatus which was relieved by meatotomy 1 month and 5 months, respectively, following operation. It is of interest to note that a resectoscope, an instrument so often blamed for meatal stricture, had not been used in either of these patients. One of them, however, had worn a 24F Foley catheter for a period of 5 days. Five months later the meatus would admit only a filiform bougie. Another patient experienced a return of urinary difficulty 13 months following operation when an examination revealed definite evidence of carcinoma of the prostate with metastases. In another case in which a greatly overdistended bladder had been drained of 4 liters of urine at the original catheterization, urinary difficulty persisted in spite of a primary retropubic prostatectomy. Eight days following operation there was 660 cc of residual urine due to vesical atony, for which a transurethral resection of the vesical neck was performed with the hope that it would enable him to empty the bladder more completely. At the time of his dismissal 28 days following operation, there was still 330 cc of residual urine. This patient reported, however, 1 year later that bladder function was satisfactory, there was no urinary difficulty and he was highly pleased with the functional result. True vesical neck contracture having occurred in only 3 instances of 116, compares favorably with the incidence of this complication following any other type of prostatectomy. Shivers and Groom, in a review of a large group of collected cases in which suprapubic prostatectomy was performed, reported urethral stricture occurred in 4.6 per cent. The complication is most common following transurethral resection as reported by these authors, having occurred 453 times in 8,508 collected cases (5.3 per cent).

Urinary fistula. There was not a single instance of persistent urinary fistula in this series. Farman and Lemon reported its occurrence in 4 instances of their collected series of 1,149 cases. Millin states definitely that suprapubic urinary leakage usually means faulty capsular suturing. It occurred in 9 per cent of his first 400 cases. In his last 200 retropubic prostatectomies for benign hyperplasia, there were 9 instances of postoperative urinary leakage (4.5 per cent); there were no cases of persistent urinary fistula. A special effort has been made in this series to effect a watertight closure by employing a double row of chromic catgut No. 1 sutures, the inner one of which is interlocked. We have considered it extremely important to prevent urinary leakage into the retropubic space, primarily in order to avoid urinary extravasation and the usual attendant infection, and, secondarily, with the view of preventing a persistent urinary fistula. In this so far our efforts have been successful.

Osteitis pubis. This distressing late complication is by far the most important

one because of the prolonged period of disability engendered by it. In a review of the literature pertaining to osteitis pubis, one is impressed with its increasing incidence in recent years before the introduction of retropubic prostatectomy. Undoubtedly, the complication has been referred to under several different terms among which might be mentioned periostitis pubis (Wilhelm and Freed), osteochondritis (Barnes; Pierson), osteoporosis of the pelvic bones (Bruskewitz and Ewell), chondritis of the symphysis (Lich, Grant and Maurer), and obturator neuritis. Beer in 1924 is credited with the first report of the disease and Rosenberg and Vest in 1948 found 48 reported cases in the literature, 45 in men and 3 in women. There were 42 instances following suprapubic prostatectomy and one each following perineal prostatectomy, symphysiotomy and delivery with vaginal fistula, infected herniorrhaphy and cystostomy, occupational trauma to the lower abdomen and acute pyelonephritis. McGinn in 1949 reported a fourth case in a woman following ureterolithotomy.

The exact etiology and pathogenesis of osteitis pubis have remained somewhat obscure. Most authors stress the importance of avoiding traumatizing the periosteum of the pubic bone such as might be incurred by the prick of a needle, injury from retractors, excessive heat from electrosurgery, or too vigorous retraction of the recti muscles. Millin in 1949 reported having experienced the complication 6 times in 757 retropubic prostatectomies; in 3 of these it was of a severe degree. His impression of the possible relationship of the etiology to the use of the sulfonamides and antibiotics is of interest in that these agents may induce "prompt healing of the superficial wound with locking up of Pseudomonas pyocyanea and other resistant organisms. Accordingly, we have now abandoned the routine use of penicillin and employ it only when it appears to be definitely indicated." Beach performed a biopsy in 2 cases which revealed changes in the bone indicative of panosteitis. He expressed the belief that it is caused by trauma, septic spill and inadequate drainage with the accumulation of urine or septic material behind the pubis, overspreading the nutrient foramina. Bruskewitz and Ewell reported three cases and were inclined to agree with Wheeler that the condition is an acute atrophy of bone of the Sudeck type.

From a bacteriologic standpoint several organisms have been suspected in osteitis pubis. Abrams, et al., in 1949 reported 5 cases in all of which culture of the urine revealed Pseudomonas aeruginosa. Muschat obtained a positive culture of B. proteus in 1 case and Kleinberg recovered B. coli. In our series aspiration of material from the region of the involved pubic bone in several cases was submitted for culture, all of which remained sterile. Unfortunately, there has been little opportunity to study these cases thoroughly from a pathologic standpoint as, in most cases, the disease runs its course and is regarded by many as self-limited and is seldom fatal.

In the series under discussion, of the 116 retropubic prostatectomies, there were thirteen instances (11.2 per cent) of osteitis pubis, 6 of which might be regarded as severe, 2 of moderate degree and 5 were mild. The onset of symptoms varied from 2 weeks to 5 months postoperatively, averaging 2 months. Moderate pain and tenderness appear in the region of the symphysis, soon followed by a

severe discomfort accompanied by muscular cramps effecting the adductor magnus group of muscles in the inner aspect of the thighs. Paroxysmal pain in these regions is precipitated by any effort to move the pelvis or lower extremities and the patient becomes completely disabled, lying quietly as possible in bed in utter fear of any movement involving the lower torso or thighs. As a rule there is no external evidence of an inflammatory process and the early roentgen examination of the region is essentially negative. In 9 of the cases in this series the incision had healed per primam and in 4, there was a minimal degree of infection in the immediate postoperative period. Later on definite changes occur in the roentgen findings including areas of rarefaction of the pubic bones, increased density of the medial margins of the pubic rami and a widening of the symphysis pubis.

Our experience with this complication has been rather remarkable in that 13 cases were encountered among the first 80 cases (16.3 per cent) of retropubic prostatectomies performed. During the past 21 months the operation has been performed in 79 cases without the occurrence of a single instance of osteitis pubis. These cases have been critically reviewed in an effort to discover the responsible factors. It was realized that the incidence of this complication was entirely too high which prompted the following alterations in technique: More gentle retraction of the recti muscles was adopted; the prostatic capsule was incised between hemostatic sutures where formerly the veins comprising the plexus of Santorini were seized with hemostats and electrocoagulated; the use of the electric scalpel for incising the prostatic capsule was abandoned in favor of a sharp knife; an aqueous solution of sulfamylon containing 5,000 units of streptomycin per 100 cc for prophylactic reasons was used locally in the prostatic cavity and the entire incision; an all out effort was made to effect a watertight closure of the prostatic capsule as previously mentioned, employing two rows of sutures instead of one. Every conceivable effort has always been made to avoid traumatizing the pubic bone or its periosteum. The relative importance of any one of the possible factors mentioned cannot be definitely stated. The disappearance of the complication, however, has been a most gratifying experience and a source of encouragement to continue employing retropubic prostatectomy in selected cases.

Treatment has included the widespread use of chemotherapy and the antibiotics with rather indifferent results. Rosenberg and Vest advise immobilization of the involved parts, heat and diathermy for symptomatic relief, drugs such as prostigmine and atropine for relief of muscle spasm, incision and drainage if a pelvic abscess develops and adequate sedation. Vitamin B-1 in massive doses has also been suggested, especially in those cases in which a possible obturator neuritis is in evidence. Goldstein and Rubin in 1947 advocated the use of deep roentgen therapy and, in our experience, this has proved to be the most worthwhile single therapeutic agent, especially if the complication is recognized early and roentgen therapy is initiated promptly. In one of our cases with fully developed symptoms, there was very prompt improvement after 300 roentgen units of therapy and he was able to walk out of the hospital unassisted after 10

days. In several other cases of a more advanced form, there was very definite improvement soon after x-ray treatment was started, whereas they had proved refractory to the other usual measures.

Mortality. There were two hospital deaths in the series (1.7 per cent). A man aged 74 had undergone a considerable degree of urethral trauma from attempts to pass a catheter by his home physician. An emergency suprapubic cystostomy was necessary. His recovery was slow and he was allowed to return home on the eighth postoperative day and was re-admitted for a secondary retropubic prostatectomy 3 months later, having experienced one massive hemorrhage from the bladder in the interval. A gland weighing 140 gm. was removed, following which there was an unusual tendency to bleed and there was low grade fever for a number of days. He received a total of 5 blood transfusions in spite of which he underwent a slow decline. A blood culture revealed Streptococcus faecalis and there was clinical evidence of acute bacterial endocarditis. He expired on the twenty-fourth postoperative day. Necropsy revealed acute bacterial endocarditis and fibropurulent pericarditis. The other death occurred in the case of a man aged 68 on whom a primary retropubic prostatectomy had been performed with removal of a gland weighing 90 gm. The operation was without incident but on the second postoperative day he expired suddenly from coronary occlusion as proved by necropsy. The immediate low mortality rate has been a source of gratification and compares with an over-all mortality rate of 4.1 per cent as reported by Farman and Lemon in their review of 1,149 collected cases. The mortality rate in 757 cases reported by Millin, MacAlister and Kelly was 4.6 per cent.

Fifteen patients of this group have expired from various causes since their dismissal from the hospital, the survival periods varying from 2 months to 28 months. Most of these were unrelated to prostatic obstruction such as: acute leukemia 24 months postoperatively, inoperable carcinoma of the stomach 2 months postoperatively, and several from cardiac disease. When one considers that the average age of the entire group of 116 cases at the time of operation was 69.5 years, the loss of 15 patients from various causes 1 to 3 years following the operation would hardly be considered unexpected since the average age at the time of death was 75.5 years.

SUMMARY

The results and complications are reviewed in a series of 116 retropubic prostatectomies in which more than a year has elapsed since the operation. By means of personal observation and the submission of a questionnaire, inquiry was especially made regarding general health, weight, sexual power, urinary difficulty, bladder function, urinary control, nocturia, hematuria, pyuria, pyelonephritis and osteitis pubis.

Such complications as epididymitis, secondary hemorrhage, persistent or recurrent urinary difficulty, urinary fistula and osteitis pubis are discussed along with a report of their incidence in the series. There were two hospital deaths, indicative of a mortality rate of 1.7 per cent. Fifteen patients, whose average

age was 75.5 years, expired from various causes from 2 to 28 months following operation.

The impression has been gained that through merit retropubic prostatectomy has earned recognition as a standard procedure for the relief of prostatic obstruction along with the other time-honored approaches of suprapubic, transurethral and perineal prostatectomy.

899 Madison Ave., Memphis, Tenn.

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EXPERIENCES WITH RETROPUBIC PROSTATECTOMY

W. HOUSTON TOULSON AND (by invitation) HOWARD B. MAYS AND CHARLES W. HAWKINS

It was not until 1948 that we ventured to use retropubic prostatectomy in our clinic. Since this time we have done more than 100 operations by this route.

The patients selected for this procedure were considered to have definite prostate gland enlargements to a grade 2 at least, and all but 5 were thought to be benign. In 2 of the 5 cases the diagnosis was prostatic carcinoma, and in 3 clinical and x-ray evidence of prostatic calculi was present.

The same preoperative care was used in the retropubic operations as in the other types of operations.

The surgical technique which we followed was essentially the same as that described by Millin and emphasized by Bacon and others: "Proper exposure of the retropubic space, gentle dissection, maintenance of a dry field, excision of a section from the posterior edge of the vesical neck, when necessary, thorough hemostasis and adequate repair of the prostate capsule." To this may be added proper postoperative drainage.

About three-fourths of the cases in this series were private patients and the other fourth came from the free wards. Some well calculated risks were taken in this series of patients as with patients usually operated on by other methods.

In this series of 105 patients on whom retropubic prostatectomy was done, there were 5 deaths (4.7 per cent). Three of these deaths were due to coronary thrombosis and 2 to pulmonary emboli.

A high incidence of osteitis pubis has been reported as a distressing complication of this method of operation. Therefore, we have given the greatest consideration to the technique of exposing the prostate gland without traumatizing the periosteum of the pelvic bone either by pressure of retractors or by pricking the periosteum with needles. In our closure we are careful to carry the postoperative drains away from the symphysis pubis, and drain the prevesical space adequately.

None of our patients has so far developed osteitis pubis, nor has obturator neuritis been encountered. This fact we must attribute to the care given the bony structures. We have had no persistent urinary fistulas, no abscess in the prevesical space and no strictures of the urethra, as reported by some operators.

We have had 6 cases of mild postoperative bleeding; all of these patients responded well to the administration of whole blood and fluids. These hemorrhages have occurred as early as several hours to as long as 10 days postoperatively. Postoperative hemorrhage has not been severe enough to require cystotomy. Our experiences with oxycel and gel foam have not been satisfactory.

In this series, 7 per cent of the patients had postoperative epididymitis; two of them had bilateral epididymitis. None of the patients had vas ligation. We believe now we have relied too heavily on chemotherapy to control the infection

occurring in the seminal tract. One of our patients developed a scrotal abscess while on drug therapy, adequate we thought; this required incision and drainage. Culture of the pus from the abscess yielded staphylococci.

The age limits in the series of patients varied from 50 to 86 years with 69.4 years as the average.

The usual complaints were frequency, nocturia, dysuria, hesitancy, strangury and dribbling. Of course, acute retention of urine was the usual presenting symptom. To our surprise, 19 patients of the 105 in this series had frank hematuria upon admission to the hospital and before instrumentation. Of our 105 cases, 21 cases had negative urine cultures on admission, 25 cases had pure E. coli infections and the others had mixed infections representing organisms chiefly of the colon group with staphylococci, streptococci, etc.

The average postoperative stay in the hospital was 14.3 days. A great many of these patients, however, were discharged as early as the seventh postoperative day. The average ambulation period was 2.9 days.

Wound healing was excellent in all patients. Urinary control was good in all cases except one who complained of mild dribbling of urine for as long as 6 weeks after the operation.

Not all of the patients had postoperative residual urine estimated; there was no indication for it in most cases. Of these 105 patients, 53 per cent had clear urine within 3 months after operation. The other 47 per cent had mild to severe infection in the urine for three months or longer. In these we cultured the *B.* aerogenes most commonly. However, even in these patients with persistent postoperative infections only one had a mild residual which has been reduced with treatment. All the others were improved and are now without troublesome symptoms.

SUMMARY

Retropubic prostatectomy is another successful method for the removal of some prostatic obstructions, medium to large glands.

In this approach there is direct vision of the capsule, which can be inspected to see that all of the prostate gland is removed and bleeding stopped.

The vessels of the capsule can be perfectly controlled.

Usually the convalescence is comfortable and the stay in the hospital short.

The postoperative results are excellent.

In this series of 105 there was a mortality rate of 4.7 per cent which should be considerably improved with experience.

Medical Arts Bldg., Baltimore 1, Md.

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DISCUSSION

DR. JOHN B. WEAR (Madison, Wisconsin): I would like to show a few slides with regard to hemorrhage in this type of operation. I certainly agree with Dr. Rusche that the veins vary quite a lot. I became interested in trying to show them visually.

(Slide) In the first place, it was obvious, of course, that they probably came in through puboprostatic ligament, so I injected the first case with hippuran through the superficial vein of the penis, knowing that it would not go through. The hippuran runs out to the hip joint, so it is certainly not coming from that part of the penis.

(Slide) This was an old gentleman who had a suprapubic tube and was waiting for operation. We exposed the deep dorsal vein of the penis and injected it with hippuran, trying to show this mass of blood vessels which I ran into the first time I did a retropubic. The angle is off here, but this is behind the symphysis pubis, and, of course, the veins are leaving and going up on each side.

Then I wondered what happened to all those veins. As Dr. Burns said, they must be in there for some purpose. What happened if they were all gone? I had a patient in the hospital who had a cystectomy, which certainly meant that all of his prostate, his prostatic urethra, and the bladder were removed, so we injected him.

(Slide) Here is what happens in a patient who has had a cystectomy and a prostatectomy. You can see, there are some veins still left even after that has been done. These veins, as you visualize them, are on the posterior side of the symphysis and even after you have tied the veins, doing a retropubic prostatectomy, if you should injure one of the veins that are up against the pubis on the other side, you may have more hemorrhage, which would be difficult to control.

(Slide) This is the same type of case. We did many of these. This shows you the complete circle, how it goes all around the bladder, up to the hypogastric and down into the obturator. Certainly, even after all this tissue has been removed, it will circulate.

But this did not show it graphically enough, so we took an old gentleman who was obviously going to expire. We injected the deep dorsal vein with red latex immediately after he expired.

(Slide) This picture was taken 4 hours after death. To orient you a little, here is the symphysis pubis, cut across; this is the red latex; and the deep dorsal vein is injected here. Here is the beginning of the bladder, and from there down is the prostate, and here go these veins.

Now, this one probably wouldn't be so bad. You could probably get right in here and ligate this vein and that one, but if you should again traumatize the vein you saw going around in the injected area, which branches off into the outside and back around to the hypogastric more bleeding would occur. This, of course, is the bladder.

It occurred to me, in doing a prostatectomy, and especially a radical perineal prostatectomy, that we never have as much bleeding as we have here. Of course,

it is obvious now that you do not ligate the prostatic ligament. You can do a radical perineal prostatectomy and won't use enough blood to make much difference; maybe a couple of tablespoons. As for me, I still prefer the perineal prostatectomy where I can control all the bleeding under vision and tie the arteries. These veins you do not see in perineal surgery. I thought you might be interested in seeing these slides.

Dr. Ben D. Massey (Pasadena, Calif.): I have been in one of the centers of enthusiasm about the retropubic prostatectomy. When the operation was first devised, I thought we would see quite a bit of osteitis pubis, in the light of our previous experiences. Within a short period, we saw more draining sinuses and the symptoms of osteitis pubis at the General Hospital than we had seen in the previous five to ten years.

There is no question about it, that the operation takes considerable surgical skill and there has to be a period of training to do the operation, because when the operation was first done by the men, I think the time averages from one to three hours, and the average number of transfusions is about three; so that it does take some training.

I have felt all along that probably some of the success of the operation, the relatively low morbidity—although there is some, of course, in spite of our new antibiotics—the operation has slightly skidded to success on the use of biotics and antibiotics, because of the increased chance of infection.

If one will take a primary one-stage suprapubic prostatectomy and treat the bladder and do a closed operation, and use the antibiotics just as when closing the retropubic, one can certainly lessen one's operating time. The hospitalization, I feel, is no longer than with the retropubic, and most of those patients can be out with primary union of the wound in about eight to ten days.

One usually leaves the catheter in longer because of being afraid to take it out, because the patient has been perfectly comfortable. We have had some where the bags of the catheters have exploded and come out about the third or fourth day, and those patients did just as well with their primary one-stages as the retropubics seemed to do.

It is an excellent operation, and I think it has done a great deal to make us more conscious of how to deal with the veins and the area around the neck of the bladder.

We have done a few radical retropubic prostatectomies. We started them in the hope we might accomplish three things: 1) by not disturbing the perineal muscles there would be less incontinence than by the perineal approach; 2) the suprapubic and retropubic approach would permit better exposure and wider excision of the prostatic and periprostatic tissue; and 3) there might be less impotence.

Our experience has been that incontinence is on about the same basis as incontinence with radical perineal prostatectomy.

There were 4 of them who had immediate continence. One of the first ones that we did was incontinent for about 3 months; the other two gained immediate continence. One gained complete continence in about 1 to 2 weeks, and we have one about 6 weeks postoperatively who, within 48 hours, is perfectly continent

in bed but dribbles when he is on his feet. We feel he will gain complete continence. All have complete continence by the sixth month. Therefore, from that standpoint of incontinence, it certainly offers nothing better than the radical perineal operation.

I do believe that a wider or better exposure is obtained and that wider excision of the carcinoma-bearing tissue can be done in that everything can be skinned off the triangular ligament and the prostatic urethra cut at that point, and there is a good cleavage plane at that point. The prostate can be elevated and then, going up, one can take a very wide cuff of the bladder, cutting through the bladder just in front of the ureteral orifices and the bladder and the ureters deflect back very nicely, so that one has the specimen in hand, except for the two attachments of the seminal vesicles. It is a block specimen. Then one can cut off the attachments and pedicles of the seminal vesicles right at the pelvic wall.

I think that it certainly should be explored as a method of getting widely around carcinoma of the prostate. Impotence in this group is universal. We have done just about eight cases with that method, and I have been amazed at the low morbidity and how well they have done postoperatively. The average hospital stay was about 14 days, most of them being discharged on or about the eleventh day. The longest period of time that any of these patients were in the hospital was 17 days.

The objection that Dr. Rusche brought up, about the difficulty of suturing the cut end of the urethra to the bladder—as a matter of fact, we did the first one by anchor sutures through the edge of the bladder and through the urethra with a boomerang needle. I can't help but feel that possibly some of our incontinence was due to the fact that we held the triangular ligament and the membranous urethra open. Following that, therefore, we make no attempt to attach and do a suture of the bladder to the cut end of the distal portion of the urethra. A Foley bag catheter is inserted into the bladder, and we sometimes put very light traction sutures through the outside edge of what is to be the bladder neck, and put them through the triangular ligament, near the region of the urethra, and with the combined traction on the catheter and tying those sutures, we have gotten very nice approximation. Cystoscopically, there is smooth union of the membranous urethra and bladder and no injection after healing has occurred.

DR. LOUIS ORR, JR. (Orlando, Fla.): I would like to ask Dr. Burns why he feels it is better to open a bladder in a child or a female for open incision of the fibrous wall rather than to carry out a transurethral removal. It seems to be a much simpler proposition.

I would also ask him to explain—and I have done a number of retropubics without removing the wedge—why he feels it necessary to remove the wedge. In perineal prostatectomy, after all, the approach through the capsule is identical. In going to the prostatic capsule, instead of doing it from above, you do it from below. I have had no difficulty that I know of. I have never removed the wedge. I would like to know what are the indications for wedge removal.

DR. JOSEPH F. MCCARTHY (New York, N. Y.): We should have no pride of procedure or prejudice as to method. I think unbridled enthusiasm will never help nor will prejudiced neglect hinder this or any other procedure. If it has intrinsic merit, it will carry on of its own momentum.

I hesitate to express my opinion about this procedure. My opinion is purely academic, as I have never done it. However, my associates have done the operation. I have hesitated because I like Millin, I admire him for his mentality and his personality, but I hope that there will be a great deal of reserve, much more than is evident at the moment, in essaying this procedure. It violates practically everything we have learned about the approach to the prostate. You have wide exposures. The bleeding is about the same. The opening of the bladder neck and the urethra is altogether unnecessary, in my opinion. Apparently, we need to be re-educated on how to do a properly conducted suprapubic intra-urethral enucleation, with no messing or milling around, no laying open of wide cellular spaces, and when your patient recovers, you have lost a patient; he doesn't need you any more.

You will probably be surprised at what I hear, as the chief culprit in the promotion of resection. The older I get, the fewer resections. I think resection has suffered from unbridled enthusiasm. Where you can do a clean enucleation of an enlarged prostate—I am talking now about prostates beyond the average, prostatic hypertrophy—and do a clean suprapubic, and if you will try this newer method of endoscopic electrocoagulation of arteriolar bleeders, following preliminary packing of the cavity with hot gauze, I think you will find that there will be a recrudescence and an increased popularity for the suprapubic one- or two-stage prostatic enucleations.

Perineal prostatectomists have been off the beam anatomically. The proper way to do a perineal prostatectomy is the same type of intra-urethral enucleation as in the suprapubic. If you will put a Foley catheter bag in the urethra, put a small bougie in that catheter, so that one can always keep track of the urethra, and then get to the apex of the prostate, opening it transversely back of the external sphincter, then put in a Parker Simms bag—which was used 40 years ago and is still the best traction bag we have today—it will bring that prostate out into the operative field, one can then make an intra-urethral enucleation and have both sphincters continent.

I think we need a reconsideration and a re-evaluation of these various methods, and a great deal of caution in approaching this wide-open operation with unnecessary manipulation and unnecessary injury to very vital organs.

About vasectomy, I would like to say this, too: I consider it as one of the best procedures we can follow, if it is done early. Bilateral vasectomy is a desirable step. We do it invariably.

PROFESSOR VAN CAPELLEN (Amsterdam, Holland): You have been very kind in receiving me here. I did not want to participate in the program, or I would have prepared a paper. However, this morning, I made some notes about retropubic prostatectomy.

It came to my mind that, really, I was the first to do this operation and not

Millin. But I have abandoned the idea. That was in 1931. Perhaps you know that I was the first to use testosterone in the treatment of prostatic hypertrophy. I did experiments in old dogs before and after the injection of testosterone. I took out part of the prostate gland and examined it before and after treatment, to see if there was any difference. There was no difference.

I don't know whether you have performed experiments with dogs, in prostatic operations, but it is quite easy. You see the prostate before you, nothing like it in man. Then I thought, "Well a retropubic approach might be a means of prostatectomy in man. It will not be as easy as in a dog, though." But I always told my associates, "If you do such an operation, be careful not to open the cavum rectus, because of infection." In doing that, I have always had more success than other men who did it and had infection and fistulae and so on.

However, I was still afraid of infection. We had no drugs, we had no antibiotics, we had nothing to prevent infection. Therefore, I abandoned the idea. And I was not very agreeably surprised when Millin came along one day and described his operation. I said, "Well, I could have done that if I had not abandoned the idea so long ago."

I think that Millin's idea is a perfectly good one. After many experiences with death from the perineal and transurethral operations, this was one of the best things you could have. In a short time, I had operated upon 50 private patients, with a mortality of 1 case 2 days after operation, due to emboli. I think 2 per cent, perhaps 3 or 4 per cent, mortality is not so bad.

What are the difficulties in the operation? One of the most important things, in my opinion, is that you must not touch the pubis with a knife or more especially with a needle. I employ a boomerang needle when I work, but I go from the pubis to the bladder. Therefore, the possibility of injury to the pubis is practically nil. In those 50 cases, they had nothing to complain of as to osteitis pubis. That is one thing.

Then, my first operation was not very successful because it was followed by a stricture due to the fact, I think, that I did not take away the bladder neck, that part of the bladder neck that we all resect now, or almost always do, and I got a stricture.

Therefore, in reply to the question that Dr. Orr asked, I believe, as to why we should do that, it is to prevent stricture and for other reasons. You have to remove part of the bladder neck.

As to infection, most of our patients had infection, but the important thing is to know what kind of infection it is. We should know by culture what kind of bacilli we have, and before operation we should administer antibiotics, sulfa drugs, and so on, so that during and after operation, patients do not have to suffer so much from infection. If I say that the infection of the bladder clears up in 2 or 3 weeks after this operation, usually, I believe it is because we have this procedure so that we know what kind of bacilli are present, and we can combat the infection better from the beginning.

I like the operation in itself. I like the idea very much. But should we abandon other operations? In particular, should we abandon transurethral resection? I

do not think so. I object, personally, to removing very large glands by resection. It takes a long time, it takes two sessions sometimes, and I think in the same time we can do a prostatectomy, and perhaps do it much better. But also, with the small ones, I think the operation that Millin gave us is too complicated, and resection is much more simple for the patient and for us.

It is my policy to use the Millin operation, if possible, if the prostate is large. We cannot expect too much if it is too far behind the pubis, because those cases are the difficult ones. And with the small prostate behind the pubis, we cannot manage the operation as well as we should like to. Then we get the osteitis in these cases, in my opinion. Therefore, I use Millin's technique for the large ones which I assume are easily accessible.

Somebody said that he has no mortality in a hundred resections, I believe. Well, I can say that years ago, I had 100 Freyer operations without mortality, but in the next hundred, the mortality was 3 or 4. I believe, from what we heard this morning and what I read from Millin and his results, the time is too short to make a judgment. We need a good many operations.

In Paris, 1 or 2 years ago, there was strong opposition to this operation. Somebody had done—I have forgotten just how many, ten or thirty operations, with a mortality of 10 or 12. Well, that man did not know how to do it. Therefore, he came to the conclusion that it was better to abandon that operation and return to the resection. That is not right. We must give them a chance to feel that Millin's operation will be equal to the others that we now have.

Dr. George F. Cahill (New York, N. Y.): One complication of retropubic prostatectomy has not been mentioned and that is the increased possibility of leaving the gauze packing that was originally recommended to be placed laterally and below the prostate.

Among several such cases may be mentioned one that I had recently seen in a patient that had become obstructed while in Europe. He was operated upon there and a successful retropubic prostatectomy done, but following this he developed a low grade fever and on his return was found to have a bulging mass in his rectum which upon opening, a gauze sponge was evacuated through the rectum.

The possibility of leaving material behind is increased in retropubic over suprapubic prostatectomy.

Dr. Edgar Burns (Closing): In answer to Dr. Cahill's question regarding gauze packs in the lateral fossa, it was not shown in the illustration because we do not use them. If a pack is used, it should be removed before the enucleation is started, as it can be palpated through the capsule and may give one the impression of the remaining portion of the lobe. It is also possible that a pack inserted too tightly may predispose to obturator neuritis.

In regard to the question of transurethral resection versus retropubic removal of congenital vesical neck obstructions in children, it is true that transurethral resection is satisfactory in a great many cases. On the other hand, these obstructions are frequently recognized in late infancy and early childhood during the period when the urethra is extremely small. We have seen traumatic

strictures following transurethral resection in such patients. I believe one would get little consolation out of substituting one type of obstruction for another as a result of the procedure employed. It is in these small children that the retropubic approach is especially well adapted. Everyone who has used the retropubic approach for removal of vesical neck obstruction in children has been surprised at the area visualized as well as the ease with which the obstruction can be removed by sharp dissection. Moreover, prostatic valves, which in our experience are extremely rare, can be fulgurated and easily destroyed through this approach.

In regard to the wedge that is removed during the retropubic operation in adults as opposed to the tightening of the vesical neck in the performance of perineal prostatectomy, that question has been asked before and I frankly do not know the answer to it. We remove the wedge for this reason—in the early cases when we did not take it out, we had a few patients in whom either partial or complete obstruction developed within the first few weeks or months after retropubic prostatectomy and transurethral resection was necessary in order to remove the elevation at the posterior lip. If this is the cause of the difficulty in the postoperative period, there seems to me no contraindication to removing the wedge. It certainly is a simple procedure, which prolongs the time of the operation only a little, and since we have been doing it, there has been no postoperative retention of urine. This has also been the experience of Mr. Millin.

I think it is rather gratifying to know that the retropubic operation is not being given the same sort of "rough ride" in this country that transurethral resection received twenty years ago. Perhaps we are better educated than we were then. The small series of cases being reported by urologists with such large services as Moore and others indicates that the operation is being wisely applied.

Dr. Carl Rusche (Closing): I would like very much to add a few words relative to the resection of a wedge of tissue at the bladder neck, when retropubic prostatecomy is performed. Our early cases at the Los Angeles County Hospital developed a large number of urinary fistulas, which refused to close with an indwelling catheter; however, in the majority of cases, after a section of the tissue had been removed transurethrally, the sinuses closed. We believe, therefore, that in order to obtain the best results, the tissue at the bladder neck should be removed at the time of surgery.

DIBENAMINE AND NOR-EPINEPHRINE IN THE THERAPY OF PHEOCHROMOCYTOMA

GEORGE F. CAHILL AND (by invitation) JAMES C. MONTEITH

From the Squier Urological Clinic, Columbia-Presbyterian Medical Center, New York, N. Y.

The diagnosis of pheochromocytoma has received more attention than previously in the past several years. For not only do we now have available the established findings as presented by the clinical picture, and roentgenographic evidence with or without perineal air insufflation,[1] but significant adjuncts have been added in the form of two adrenolytic agents. The first of these, the benzodioxanes, as described by Goldenberg, Snyder and Aranow[2] have so far proved of value in the diagnosis of pheochrome tumors. These workers showed that small doses of benzodioxane had a transient adrenolytic action on the blood pressure; and the greater the amounts of circulating epinephrine, the greater the drop in blood pressure. The second of the adrenolytic agents is dibenamine hydrochloride (dibenzyl-beta-chlorethylamine hydrochloride). The action of this drug, as described by Spear and Griswold[3] and by Hoch in a separate paper,[4] is more prolonged than that of benzodioxane, lasting from 24 to 72 hours. However, one must be cautious of its side actions, and the drug must be administered over at least a 1 to 2 hour period and in considerable dilution.

It was the prolonged adrenolytic action of dibenamine in patients with pheochromocytoma and its beneficial effect on the patient as reported by the above authors that led us to use it in the immediate preoperative and operative period to facilitate handling of the tumor as well as using it several days or weeks before surgery for its therapeutic effect.

We have used norepinephrine in the operative and postoperative periods as a pressor agent because it has been demonstrated[5, 6] that this drug acts primarily as a vasoconstrictor increasing peripheral resistance; whereas epinephrine increases cardiac output and may cause cardiac arrhythmias. Epinephrine in small dosage also has been demonstrated to act as a vasodilator. Thus it was believed that norepinephrine possessed certain advantages in the therapy of pheochromocytoma.

Acknowledgement is given to the Smith, Kline and French Laboratories for the dibenamine hydrochloride.

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CASE REPORTS

Case 1. M. E., a woman aged 49, was admitted August 20, 1949 with the complaints of severe occipital headaches, blurring of vision, anorexia and vomiting. She also had experienced attacks of profuse diaphoresis and palpitations usually followed by extreme weakness. Her hypertension was first discovered in September 1948, when she went to an ophthalmologist because of blurring of vision. He referred her to an internist who treated her as a case of hypertension with salt free diet, rice diet and potassium thiocyanate. A benzodioxane test was performed on her in September 1949, and a suggestive fall in blood pressure was observed. She had suffered a rather marked weight loss because of persistent nausea and vomiting. Her hypertension had been persistent and her course had simulated that of a malignant hypertensive.

Physical examination disclosed an extremely emaciated woman appearing much older than her stated age, and weighing 77 pounds (fig. 1). Multiple flesh colored papillomas were present over the entire body, soft, some peduncu-

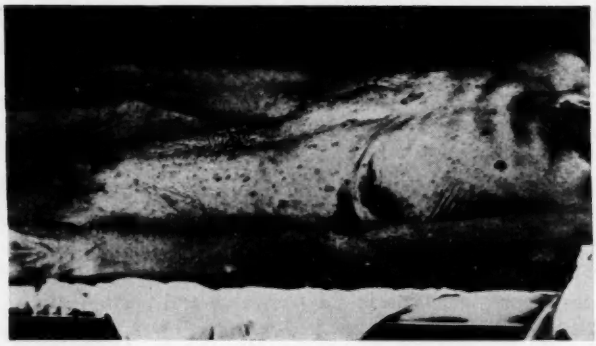

FIG. 1. Case 1. Patient on admission. Weight 77 pounds. Note neurofibromas over entire body.

lated, some with sessile bases. Fundi showed marked papilledema, hemorrhages and exudate. The neck veins were moderately distended. The lungs were clear but the heart was enlarged to the left with a harsh precordial systolic murmur, normal sinus rhythm, rate 120. The abdomen revealed no masses or tenderness.

The blood pressure was 240/130, pulse 120, respirations 24.

On admission and during her hospital stay, blood count, blood urea nitrogen, blood sugar, pre- and postoperative glucose tolerance tests, serum sodium and potassium, chlorides, P and Ca were normal. An electrocardiogram showed increased amplitude of R_2 and R_3 and the character of the P-waves suggested the possibility of auricular enlargment. A chest x-ray showed generalized pulmonary emphysema. The basal metabolism was plus 38 per cent. An x-ray of the abdomen showed a 1 cm. area of calcification overlying the midportion of the right kidney, which on excretory urography was shown to occupy the infundibulum of the right lower calyx. Bilateral aerograms were unsuccessful because of failure of air to enter the right suprarenal area (adhesions) and because of superimposed

gas on the left side. Urinalysis showed 4 plus albuminuria with occasional white blood cells on microscopic examination.

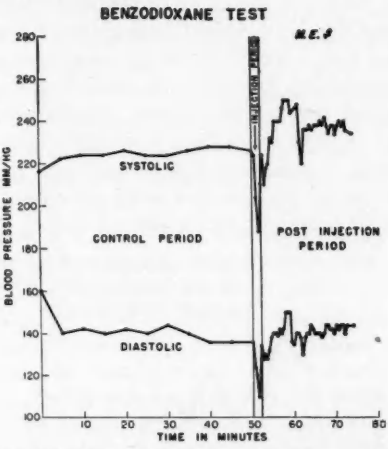

FIG. 2. Case 1. Positive benzodioxane response

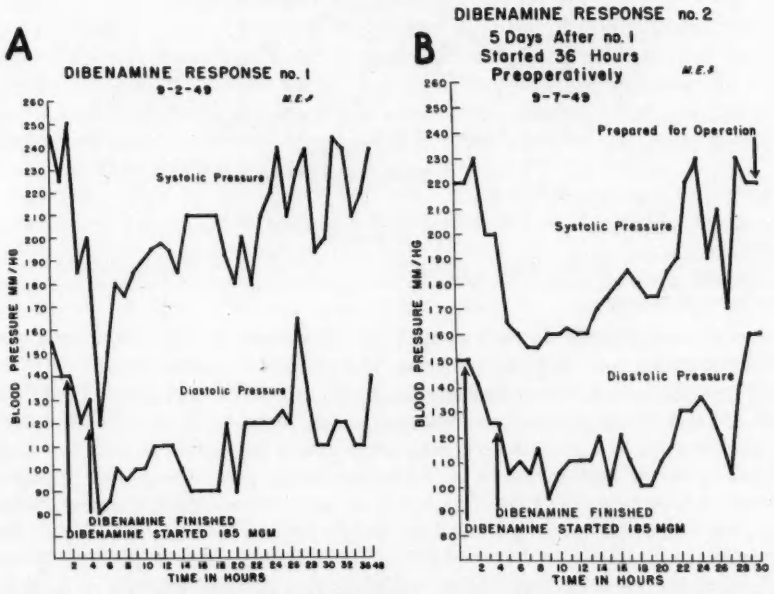

FIG. 3. Case 1. *A*, note prolonged lowering of blood pressure of approximately 24 hours' duration. *B*, response to dibenamine 5 days later.

Because of vomiting and anorexia, the patient was given daily infusions of 5 per cent dextrose in saline and 5 per cent dextrose in water. On August 24,

1949, a benzodioxane test was performed (fig. 2) and was interpreted as a positive response. The test was repeated on August 30 and was again positive.

In order to observe the effect of a more prolonged lowering of the blood pressure, dibenamine, 6 mg./kg. body weight, was given on September 2, according to the method of Spear and Griswold (fig. 3, *A*), and the blood pressure recorded every hour for 48 hours. All but 45 cc of a 500 cc solution was injected. However, the solution was stopped because the patient complained of weakness of her right arm and leg and on physical examination was noted to have parasthesias of the right side as well as weakness of the facial and tongue muscles. These symptoms, attributed to the sudden and relatively prolonged cerebral anoxia with the fall in blood pressure, gradually cleared and in several hours the pa-

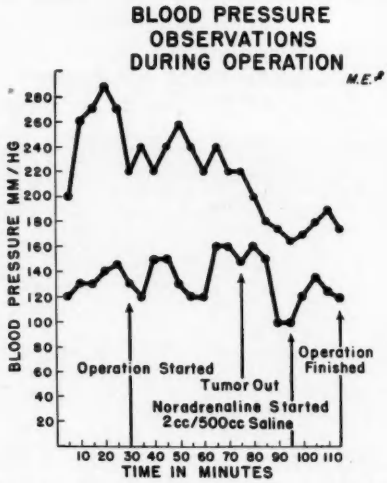

FIG. 4. Case 1. Note that despite manipulation of tumor, blood pressure did not tend to rise to extremely high levels. Noradrenaline was given to prevent marked drop in pressure after removal of tumor.

tient was feeling much better and no longer exhibited the signs of hemiplegia. On the morning following the injection, the patient was able to take nourishment for the first time since entering the hospital 3 weeks previously. Five days later a repeat dibenamine test was performed, being started approximately 36–40 hours prior to the expected time of operation (fig. 3, *B*), so that the drug would be exerting some pressor effect in the operating room. The patient tolerated this test better than the first. The transient signs of hemiplegia, again on the right, were less marked and lasted only 1–2 minutes. However, about 26 hours post injection, the patient had a bout of frank tetany with carpopedal spasm and a positive Chvostek sign. These symptoms were partially relieved by calcium gluconate intravenously. Serum Na, K, CI, CO_2 and Ca were not remarkable and after an infusion of 500 cc glucose in saline that afternoon and another on the morning of operation, the patient was feeling better. These symptoms were attributed to her vomiting.

On the twentieth hospital day Dr. George F. Cahill operated upon the patient through a transverse upper abdominal transperitoneal incision. At operation both kidneys appeared normal. The right adrenal gland was palpated as normal but could not be made out visually because of adhesions in the region of the gallbladder. The calculus previously mentioned was noted to lie within the gallbladder. Palpation along the aorta and in the pelvis failed to reveal evidence of tumor. The left kidney appeared normal, but a small amount of apparently normal adrenal tissue was observed to be compressed by a 5 by 3.6 by 2.8 cm. tumor mass. The blood vessels to the tumor were identified and ligated with a resultant drop in blood pressure (fig. 4). Noradrenaline was started at this point with maintenance of a fairly stable blood pressure, as can also be seen in figure 4. The operation was completed and the patient returned to the ward in good condition. The noradrenaline infusion was continued postoperatively for 24 hours, being run very slowly with its rate increased only if the blood pressure showed a tendency to drop markedly, which it did not in this case. One of the skin lesions was removed and on microscopic examination proved to be a neurofibroma, a lesion which has been noted in 20 per cent of our cases.

Grossly the specimen was roughly ovoid in shape, of the above dimensions and weighed 55 gm. Assay of the tumor showed it to contain 14 per cent noradrenaline (1.4 mg. per gram of tumor) and 86 per cent epinephrine (8.17 mg. per gram of tumor). Microscopically the picture was typical of a pheochromocytoma with such areas possessing large polygonal cells possessing eccentric deep staining nuclei. There were some areas of necrosis and in some locations the cells were vacuolated. Along the margin of some of the sections were remnants of compressed normal adrenal tissue. Schmorl stain revealed scattered greenish deposits in the cytoplasm of many of the cells.

Postoperatively the patient's course was relatively uneventful. Her blood pressure never dropped to within normal levels and on the day of discharge, the twenty-second postoperative day, was 174/130. Her appetite was excellent and on discharge she had gained 6 pounds. A repeat benzodioxane test on her seventeenth postoperative day was normal, precluding the possibility of the presence of more pheochrome tissue. Her basal metabolism rate was only +18 per cent as compared to +38 per cent preoperatively. The glucose tolerance test was roughly parallel to the preoperative levels, both being normal curves. A histamine test was not performed because of the patient's poor condition. She was discharged on her forty-second hospital day.

Case 2. H. B., a 41 year old man, was admitted September 16, 1949 with the complaint of recurrent attacks of dizziness, headaches, palpitation and sweating. He recalled that in 1938 while hammering nails he experienced a sudden attack of excruciating occipital headache with throbbing, flushing, palpitations, trembling, weakness and sweating. The attack lasted about 15 minutes and with its subsidence he felt extremely weak. He suffered a similar attack about 2 weeks later and thereafter continued to have 3 to 4 attacks monthly. However, during the ensuing 10 to 11 years he had noted that the attacks had gradually become more frequent until at admission he was having 5–6 such attacks a

day, of 5–10 minutes' duration. The severity of the symptoms was not so notable as in the beginning and he no longer had headaches, but in addition he was suffering nausea and occasionally vomiting. At no time had he lost consciousness nor experienced convulsions. Blood pressure readings observed during attacks had ranged as high as 280/150 and, following attacks, as low as 80/50.

He was admitted to another hospital on June 20, 1949, with a history of a 2 hour attack, more severe than usual, accompanied by dyspnea, precordial oppression, and frothy hemoptysis. He was treated for left ventricular failure

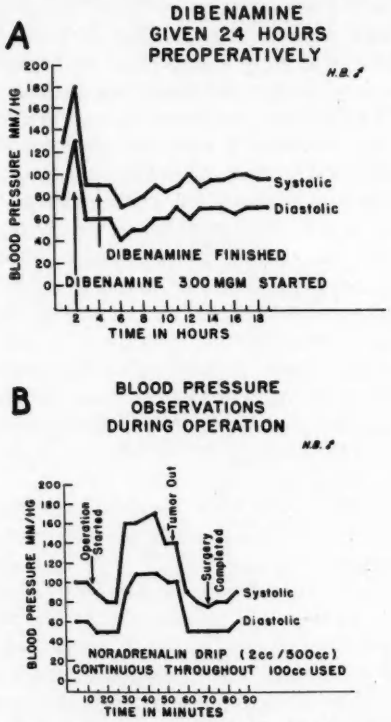

FIG. 5. Case 2. *A*, dibenamine started during attack of paroxysmal hypertension. Note resultant drop in pressure to what was normal level for patient. *B*, note less marked pressure rise than would be expected on manipulation of this tumor.

but no digitalis was given. Diagnostic workup at the hospital included a positive benzodioxane test, a mildly diabetic glucose tolerance curve, and the clinical observation of labile blood pressure. An exploratory laparotomy was performed through a right subcostal incision, following dibenamine 48 hours preoperatively. The right adrenal was reported as normal and abdominal palpation revealed no significant findings, including the left adrenal area. His postoperative course was uneventful except that he continued to have attacks similar to his preoperative ones. He was then referred to us for further evaluation and treatment.

Physical examination revealed a well developed, well nourished white man of 42 years of age. Fundi showed slight narrowing and tortuosity of arterioles but no exudate or papilledema. The lungs were clear but the heart was enlarged to the left percussing to the left anterior axillary line in sixth interspace, regular sinus rhythm, sounds of good quality, $A_2 = B_2$, blood pressure 100/80. The abdomen revealed a healed right subcostal and flank incision, no masses or tenderness, and no palpable organs. There was a small left varicocele. The remainder of the examination was normal.

Since he had been adequately worked up by laboratory methods at the other hospital we did not believe that an extensive work-up was necessary. On admission and during his hospital stay blood count and blood urea nitrogen were normal. Urinalysis showed 4 plus albuminuria, no glycosuria, and 5–12 red blood cells and 1–3 white blood cells on microscopic examination. Blood sugar was elevated to 190 mg. per cent. A glucose tolerance test, however, was not done because it had been reported as exhibiting a diabetic curve at the other hospital. A chest x-ray showed moderate cardiac enlargment but no evidence of congestion. A flat film of the abdomen was normal, and excretory urography

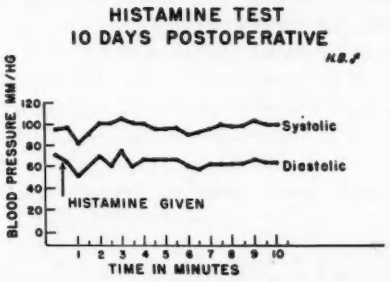

FIG. 6. Case 2. Negative histamine test, postoperative

showed that the kidneys excreted the dye in poor concentration but no unusual findings were noted. A left aerogram outlined a rounded protuberance in the region of the upper end of the left psoas measuring 1½ inches in length. There was also a small rounded shadow 1 inch in diameter in the region of the upper pole of the left kidney. The findings were interpreted as suggestive of pheochromocytoma.

Twenty-four hours prior to the operation the patient was given an infusion of glucose in saline containing 300 mg. of dibenamine (5 mg./kg.), the effects of which are recorded in figure 5, *A*. On his fifth hospital day the left renal area was explored through a transverse flank incision and a 12 cm. round encapsulated pink tumor mass was removed from the area just medial to the pelvis of the left kidney, posterior to the renal vessels. Noradrenaline (2 cc/500 cc saline) was administered slowly throughout the operation and for 36 hours postoperatively to prevent a rapid drop in blood pressure. Blood pressure observations during operation are recorded in figure 5, *B*. Postoperatively his course was uneventful. The wound healed by primary intention and the patient was symptomatically improved. A histamine test (fig. 6) showed no significant rise in blood

pressure and was interpreted as negative, indicating that no secreting pheochrome tissue remained. The patient was discharged on his eleventh postoperative day.

Microscopically the tumor was characteristic of pheochromocytoma. The cells appeared in solid masses or cords and were of fairly uniform appearance. They were large oval, triangular or polygonal with prominent vesicular nuclei and clear cut nucleoli. The cytoplasm was granular. Schmorl stain revealed cells with greenish cytoplasm which was reddish brown in areas the stain had not reached. Assay of this tumor revealed it to contain 54 per cent noradrenaline (8.8 mg. per gram of tumor) and 46 per cent adrenaline (7.5 mg. per gram of tumor).

DISCUSSION

In their recent paper Cahill and Aranow[7] considered the possibility that the use of dibenamine might be a valuable adjunct in the preoperative preparation of cases of pheochromocytoma due to the report of the case by Hoch and by Spear and Griswold. The 2 cases reported in this paper confirm the experience of the previous reporters with their one case of paroxysmal hypertension. These 2 new cases, one simulating a malignant hypertension persistent in character[8, 9] and the other a typical case of paroxysmal hypertension, were both given dibenamine 24–48 hours preoperatively so that its effects would be evident at surgery. In the case of persistent hypertension, 2 injections were given 5 days apart with improvement in the patient in the interval between the injections. As can be seen in figure 3, *B*, the effect of the drug had almost been dissipated as regards blood pressure observations at time of operation. In retrospect it probably would have been better to have operated when the pressure was lower.

A previous case reported[10] had a similar improvement due to a spontaneous thrombosis in the main artery to the tumor. This thrombosis occurred during a period of paroxysmal hypertension and was associated with a high fever and delirium. On abatement of the fever the tumor was removed operatively without any reaction at the time of the handling of the tumor. The tumor was found to be undergoing ischemic necrosis secondary to vascular thrombosis at removal, and the amount of hormone secreted or available for secretion was small. The effect of dibenamine has been considered to be upon the muscle nerve endings in the smaller arterioles, that is on the effector cells.[11] Both the tumors removed in the present cases had areas of infarction and focal necrosis. The lessened volume of adrenalin containing tissue produced smaller amounts of pressor substance. Thus the pressure did not tend to rise to extremely high levels on handling the tumors in both cases. The question still remains whether dibenamine

[7] Cahill, G. F. and Aranow, H., Jr.: Pheochromocytoma: Diagnosis and treatment. Ann. Int. Med., **31:** 389–404, 1949.

[8] Thorn, G. W., Hindle, J. A. and Sandmeyer, J. A.: Pheochromocytoma of adrenal associated with persistent hypertension. Ann. Int. Med., **21:** 122, 1944.

[9] Palmer, R. S. and Castleman, R.: Paraganglioma (chromaffinoma): Pheochromocytoma of adrenal gland simulating malignant hypertension. Report of a case. New Eng. J. Med., **209:** 793, 1938.

[10] Cahill, G. F.: Pheochromocytoma. J. A. M. A., **138:** 180, 1948.

[11] Hecht, H. H. and Anderson, R. D.: Influence of dibenamine on certain functions of sympathetic nervous system in man. Am. J. Med., **3:** 3–17, 1947.

is a factor in causing necrosis and infarction. This could be due to anoxia in the tumor as a result of the prolonged drop in blood pressure produced by the drug. Thus it may be conjectured that the drug exerts a secondary effect on the pheochromocytoma as well as its primary one on the effector cells of the vascular system.

Also, in both cases the use of norepinephrine[5, 6] during operation and the first 24 hours postoperatively, prevented a marked drop in blood pressure from occurring. The effect of norepinephrine was not so marked in case 1 as in case 2 because the blood pressure did not tend to approach hypotension levels at any time, but in fact remained elevated throughout the patient's hospital stay although it was considerably lower than preoperative levels. In case 2 the effect of norepinephrine was more noticeable because of the tendency of the blood pressure to drop to shock levels during the first two postoperative days.

The assay of the tumor in case 1 showed it to contain 14 per cent norepinephrine which, according to Goldenberg[12] is the amount one would expect to encounter in the normal adrenal. In case 2 the tumor contained 67 per cent norepinephrine.

Postoperatively both cases were tested to determine if all excess pheochrome tissue had been removed. In case 1 a benzodioxane test was performed because the patient's blood pressure was still elevated, and it was felt that if a drop in the pressure did occur, it would not be harmful. In case 2 a histamine test[13] rather than a benzodioxane test was performed because of the low level of the blood pressure throughout the hospital period. This test also was negative.

SUMMARY

Two cases of pheochromocytoma have been presented, one with a sustained blood pressure simulating a malignant hypertension, and the other exhibiting paroxysmal attacks of hypertension. Dibenamine hydrochloride was administered to both cases in the immediate preoperative period, so that the effect of the drug would be evident at operation. The effect of the drug when pheochromocytomas are handled during operation has been discussed. The possibility that the drug has a secondary effect on the pheochromocytomas themselves in which necrosis and infarction were noted, has been undertaken. This may have been the result of anoxia in the tumor secondary to prolonged lowering of the blood pressure.

Norepinephrine was used in both cases in the immediate postoperative period, and its effect in maintaining stable blood pressure levels has been considered as well as its advantage over epinephrine because it increases peripheral resistance and does not increase cardiac output or produce arrhythmias.

The postoperative use of benzodioxane or histamine to determine the absence of further excess pheochrome tissue was also taken up, and in both cases the test used was negative.

121 E. 60th St., New York, N. Y.

[12] Goldenberg, M.: Personal communication.

[13] Roth, G. M. and Kvale, W. F.: Tentative test for pheochromocytoma. Am. J. Med. Sci., **120**: 653, 1945.

THE THORACO-ABDOMINAL INCISION IN UROLOGICAL SURGERY

RICHARD CHUTE

From the Massachusetts General Hospital, Boston, and the Veterans Administration Hospital, West Roxbury, Mass.

Since the deliberate employment of a thoraco-abdominal incision for the removal of kidney tumors was first reported[1, 2] about two years ago, this incision has come into constantly increasing use. Furthermore, increased experience with this approach has shown that, in addition to being of great value in the surgery of renal neoplasms, it is extremely advantageous in dealing with certain other conditions, and it is the purpose of this paper to call attention to the various uses of this incision in urological surgery. In addition to reports in the literature[3, 4] the author knows of various instances of its use here and there, but this communication will be based on the 68 cases in which the incision has been used by the author and by various of his colleagues at the Massachusetts General Hospital in Boston and the Veterans Administration Hospital in West Roxbury, Massachusetts.

Why is this incision finding increasing favor despite the fact that it is technically more complicated than an incision limited to the abdomen? The answer can be given in just three words: "superlatively good exposure." Since the diaphragm is frankly in the chest, and the kidneys lie to a considerable extent within the bony thorax and are sheltered by the lower ribs, it is a matter of common experience to have the unyielding bony thoracic cage interfere frequently with free and satisfactory exposure of the kidneys and the region immediately under the diaphragm when the usual lumbar approach is used. Even when the lumbar incision is made through the bed of the removed twelfth rib, or when the transperitoneal approach is used, there is often unsatisfactory surgical exposure of this region, especially when dealing with large kidney tumors. The thoraco-abdominal incision, by its approach directly through the chest and through the diaphragm, gives a magnificent wide exposure of just that area which is most difficult to expose by the other incisions, and that is why it is finding great favor. Particularly in the case of large kidney tumors, it has made their removal comparatively easy and safe instead of extremely difficult or even impossible, and for this advantage surgeons are glad to pay the price of employing this somewhat more complicated and time-consuming incision.

Undoubtedly the thoraco-abdominal incision's greatest value in urological

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[1] Morsensen, H.: Transthoracic nephrectomy. J. Urol., **60:** 855–858, 1948.

[2] Chute, R. and Soutter, L.: Thoraco-abdominal nephrectomy for large kidney tumors. J. Urol., **61:** 688–696, 1949.

[3] Marshall, D. F. and Drake, E. H.: Transthoracic nephrectomy for metastatic osteogenic sarcoma of kidney. J. Urol., **62:** 655–659, 1949.

[4] O'Conor, V. J. and Head, J. R.: Transthoracic nephrectomy (right) for tuberculosis of kidney. Surg., Gynec. & Obst., **89:** 599–604, 1949.

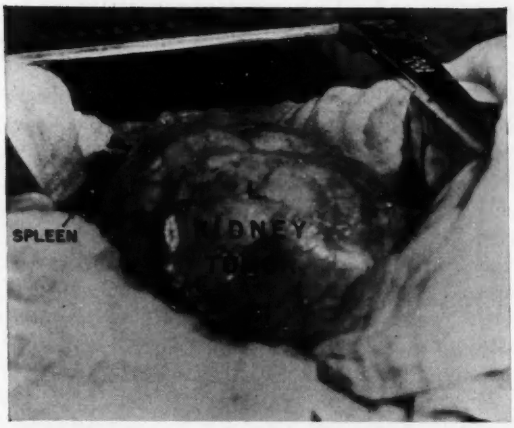

FIG. 1. Photograph taken at operation showing wound spread wide with rib retractor, and large tumor of left kidney bulging up into wound of its own accord. As yet, it has not been freed up at all. Spleen is packed away above. Patient living and well 3 years after operation.

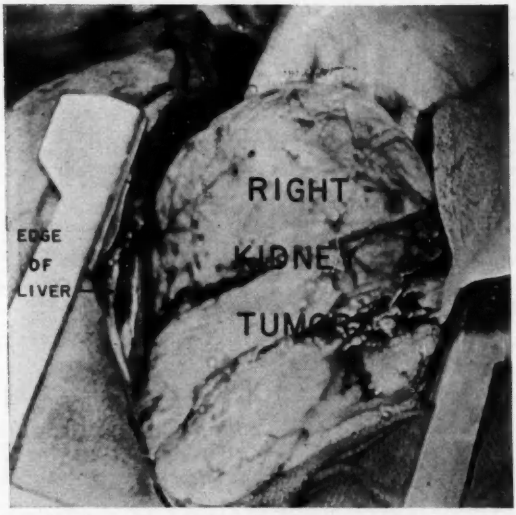

FIG. 2. Photograph taken at operation, showing wound spread wide with rib retractor, and huge tumor of right kidney (weight 1245 gm., 2.6 lbs.) presenting of its own accord. As yet it has not been freed up at all. Liver is easily retracted upward out of way. Patient living and well 25 months after operation.

surgery is in operations on renal tumors[5], of which there are 28 in this series. The wide open exposure gives a number of really important advantages: First, the vessels of the renal pedicle can without difficulty be discovered, exposed,

[5] Chute, R., Soutter, L. and Kerr, W. S., Jr.: Value of thoraco-abdominal incision in removal of kidney tumors. New Eng. J. Med., **241:** 951–960, 1949.

and ligated under direct vision before the kidney has to be freed up (figs. 1 and 2). This greatly increases the ease and safety of the operation, and decreases the liability to accidents such as uncontrollable hemorrhage or injury to the inferior vena cava, which are usually the result of inadequate exposure and resulting imperfect visualization of important structures. Preliminary ligation of the renal pedicle makes the subsequent removal of the kidney tumor easy and bloodless. It also obviates the bothersome and sometimes dangerous hemorrhage from large veins which often course over the surface of some of these big tumors.

It seems very probable that some of the metastases which not infrequently follow the removal of malignant kidney tumors may be due to particles of tumor having been literally squeezed into the blood stream by the manipulations of the surgeon while freeing up a large tumor in order to get at its pedicle. Therefore, it would seem that early ligation of the pedicle before the kidney is manipuated or freed up cannot help but check that type of metastatic spread and thus

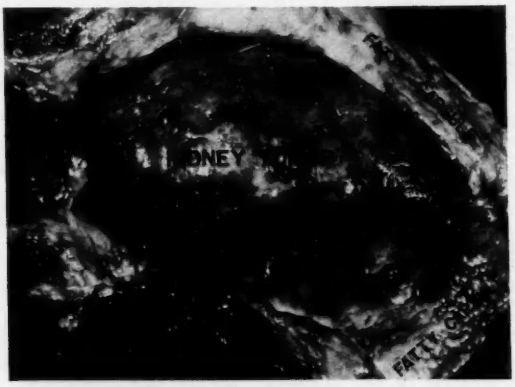

FIG. 3. Fatty capsule surrounding kidney tumor has been split to show its thickness. Patient living and well 2 years after operation.

improve the chances of cure. Another feature of the thoraco-abdominal incision is that the plane of cleavage naturally encountered is outside the perinephric fat and the capsule of Gerota, so that these are easily removed en bloc with the kidney (fig. 3). This is important when dealing with cancerous kidneys, as there may be direct extension of malignant disease to the perinephric fat. Room is also given for the removal of regional lymph nodes in the region of the pedicle and along the aorta and vena cava. This has been done in a number of the tumor cases, and many of the nodes have shown malignant involvement (fig. 4). Ample exposure is afforded to deal with unusual situations of which the following are examples: In several cases tumor thrombus has been found in the renal vein, and in one case the thrombus not only extended into the vena cava but had grown to its wall so that a portion of the wall had to be resected and then the cava sutured (fig. 5). Another tumor had involved part of the right lobe of the liver by direct extension, and it was possible to resect this and apparently get around the disease. In one case the vena cava was involved by direct extension of a right

renal tumor about it and was ligated below the level of the left renal vein, and the involved section removed. It is significant that in 15 or more than half of the 28 cases of tumor, local extension was found at operation, and this figure would probably have been higher had not 2 of the tumors been rare benign ones,

FIG. 4. Large tumor of left kidney (shown in figure 1) removed en bloc with attached metastatic nodes. Note that all surrounding fatty capsule is removed with kidney. Patient living and well 3 years after operation.

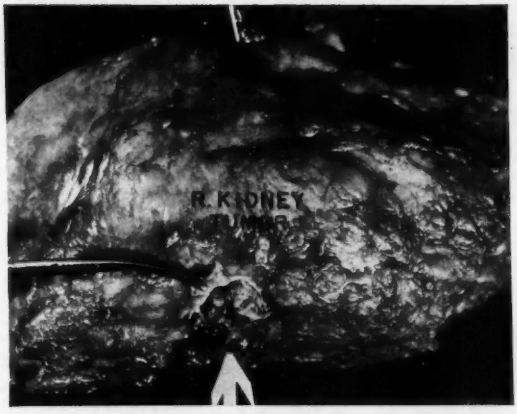

FIG. 5. Carcinoma of right kidney with tumor thrombus growing into inferior vena cava and adherent to it. In order to remove thrombus, part of wall of vena cava had to be resected and sutured. Patient living and well 2 years after operation. White arrow points to tumor thrombus. Hemostat is holding up renal vein and portion of vena cava.

one a cystic teratoma, the other a hamartoma. This means that the odds are in favor of discovering at operation some local extension, requiring more extensive surgery than simple nephrectomy. In such difficult cases the difference between success and failure may depend upon whether or not there is adequate exposure

to carry out delicate and exacting surgical procedures. Therefore it is the opinion of the author and his colleagues that all kidney tumors, no matter what their size, should be operated upon by the thoraco-abdominal route, which gives adequate exposure, no matter how extensive the procedure. Thus in half of those cases with local extension, it was possible to remove all the obvious disease. As a corollary, it is not surprising that this incision has allowed the extirpation of large carcinomatous kidneys whose removal had been attempted by another approach but found impossible. In one of the cases, a large tumor whose removal had been attempted unsuccessfully by way of the lumbar route by an experienced surgeon, was later removed successfully by the same surgeon via the thoraco-abdominal route. In the opinion of the operating surgeons, at least 10 of these 28 tumor cases could not have been removed successfully through an incision giving less wide exposure. In this connection, it is significant, and an unusual record I believe, that in only one of our 28 cases of renal tumor, some of which were very large and adherent with local extension, was the kidney not removed. In this one case, widespread local extension of the malignant disease contraindicated any attempt at nephrectomy. Although it is the author's firm conviction that the surgical procedures made possible by the exposure afforded by the thoraco-abdominal incision will eventually be shown to increase the cures and lengthen the time of survival of patients with kidney tumors, the number of patients is too small and the follow-up period too short to allow any conclusions of value to be reached at the present time. However the figures are as follows: Sixteen of the 28 tumor cases, including the first patient operated upon in January 1948, who had involved lymph nodes excised en bloc with his renal carcinoma, are living and apparently well of their disease. (Among these are 6 whose follow-up period has been exceedingly short, as they were operated on in recent months.) Four are living with metastases which were seen at the time of operation. Six patients, all but one of whom were seen to have metastases at the time of operation, have died of their disease. There was one postoperative death, and one patient never returned for follow-up after his operation.

Since tumors of the adrenal gland are situated high up under the diaphragm above the kidneys, the surgical approach to them is even more hindered by the ribs, and their exposure by the usual approaches is even less satisfactory than is the case with kidney tumors. As in the case of the latter, it has been found that the thoraco-abdominal incision affords excellent direct exposure of the adrenal region—definitely better than that obtained by any other approach. The urological staff of the hospitals where the author does his work does not do the surgery of adrenal tumors, and therefore the author has had no personal experience in such cases. However, he can definitely state that the surgeons who do operate on adrenal tumors at these hospitals have found the thoraco-abdominal incision so satisfactory that they have been using it routinely for about two years in cases of adrenal hyperplasia in heavily built persons, and for all adrenal tumors in adults, except pheochromocytomas. In the case of pheochromocytomas, since they may be multiple and scattered, and so much

variation is possible in their location, it is believed that an abdominal incision usually gives the best opportunity to explore the region of the adrenals and the abdomen with a view to removing any pheochromocytomas discovered. However, if the pheochromocytoma is seen in the x-ray film to be in the usual position of the adrenal, the thoraco-abdominal incision might be used. About 12 adrenal operations have been done using this approach with very satisfactory results. These are in addition to the 68 urological cases upon which this report is based.

A situation in which the thoraco-abdominal incision is indispensable is in cases where the kidney should be removed but where due to the bony deformity of extreme kyphosis or scoliosis the rib cage makes an impassable barrier to the

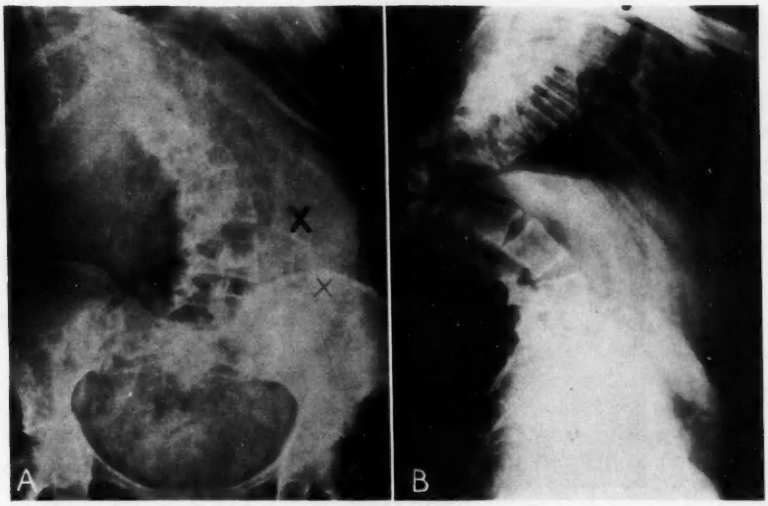

FIG. 6. *A*, patient with marked rotoscoliosis. Thoraco-abdominal nephrectomy for pyonephrosis and perinephric abscess on left (marked X). Wound healed without significant sepsis. *B*, patient with extreme kyphosis. Poor anesthetic risk because of very low vital capacity. Tuberculous right kidney causing severe bladder symptoms removed thoraco-abdominally without trouble. Excellent convalescence.

usual type of lumbar approach. Two such cases have been encountered and operated upon successfully. One was a woman of 68 who had a large pyonephrotic kidney on the left that was giving her symptoms. She also had a marked rotoscoliosis concave to the left making the usual lumbar approach out of the question (fig. 6, *A*). She was operated on thoraco-abdominally and the large pyonephrotic kidney removed. In addition, there was a perinephric abscess. With the aid of antibiotics, the wound healed without significant sepsis. The second case was more extreme. The patient was a woman of 35 who had had tuberculosis of the spine as a child with resulting extreme kyphosis. Five years previously hematuria, frequency, dysuria, and urgency had appeared, and it was found that she had tuberculosis of her right kidney, while the other kidney

was normal. She had been seen by two excellent urologists who felt that nephrectomy was out of the question on account of her kyphosis (fig. 6, *B*), and she had been relegated to a sanatorium life. Because of exacerbation of her urinary symptoms, her case was reviewed and, although she was considered a poor anesthetic risk due to her very low vital capacity, thoraco-abdominal nephrectomy was carried out successfully. She made an excellent recovery.

A fourth condition in which the thoraco-abdominal approach has been found to be markedly advantageous is in performing retroperitoneal dissections to remove lymph node metastases from carcinoma of the testis.[6] The lymphatics from the testes accompany the spermatic vessels upward to the general region of the renal pedicle and the aorta and vena cava at that level. This is the area

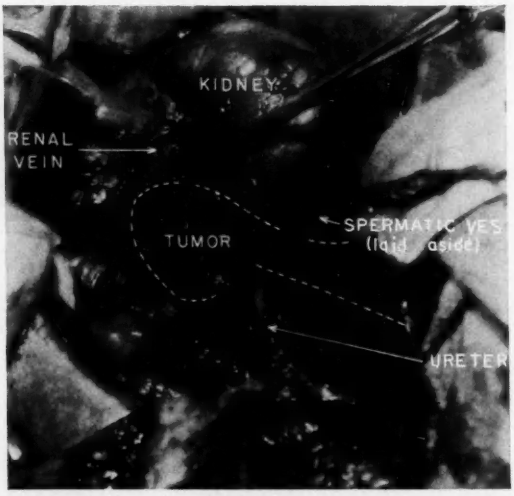

FIG. 7. Retroperitoneal dissection (left) for metastases from carcinoma of left testis Thoraco-abdominal incision used. Note excellent exposure of region of renal pedicle and great vessels. Hemostat is pointing to large mass of tumor tissue (indicated by dotted line) at upper end of spermatic vessels just below renal vein. Tumor incased aorta and infiltrated left psoas muscle, and was inoperable.

of the embryological development of the testes, and there is evidence indicating that this region is the primary site of lymphatic metastases from carcinoma of the testis. Secondary lymphatic spread of the malignant disease across the midline, down along the large vessels to the iliacs, and also above is frequently seen. Without going into a discussion of the various types of malignant testicular tumors, and in which types and situations lymphadenectomy is indicated, suffice it to say that when retroperitoneal node dissection is indicated, experience with the thoraco-abdominal approach on 7 occasions has shown it to be definitely superior for this purpose to other types of surgical

[6] Cooper, J. F., Leadbetter, W. F. and Chute, R.: The thoraco-abdominal approach for retroperitoneal gland dissection: Its application to testis tumors. Surg., Gynec. & Obst., **90:** 486–496, 1950.

approach, such as transforming the upper end of the incision into a lumbar kidney incision, as it gives far better access to and exposure of the region of the renal pedicle, and above it up to the diaphragm (fig. 7). The thoraco-abdominal incision in the region of the tenth rib is extended obliquely downward lateral to the rectus muscle into the lower quadrant of the abdomen toward the pubic bone to permit the dissection of the lower abdominal and pelvic lymph nodes.

Another important use for the thoraco-abdominal approach is to facilitate nephrectomy in cases of chronic calculous pyelonephritis or pyonephrosis. Such cases are apt to have dense perinephric fibrous adhesions which make surgery very difficult indeed, especially in those cases previously operated on, which are notorious for dense scar formation. In such cases, the thoraco-abdominal incision, by giving a very wide exposure, has allowed the pedicle to be approached and secured from the anterior-medial aspect facing the peritoneal cavity where adhesions and scar tissue are apt to be either minimal or absent. Following the ligation of the pedicle, the kidney can be dissected out carefully without bleeding. Nephrectomy has been performed on 8 such difficult cases with satisfaction and success. Four of the 8 had had a previous attempt by a competent surgeon at removal of the kidney through a lumbar incision, but these attempts had been unsuccessful because the kidneys were so "stuck." Because of continuance of bothersome symptoms, including pain, and depression of their general condition, it was decided to try to remove their kidneys thoraco-abdominally, and this was accomplished successfully.

DISCUSSION

In this series of 68 thoraco-abdominal urological operations, which does not include the dozen thoraco-abdominal adrenal operations, the incision was performed 36 times on the left and 32 times on the right. On the right side, the liver has always been easily retracted upward, so that it has never been in the way, even in one case where it was moderately enlarged.

The patients varied in age from 1 year (a baby boy with a large cystic teratoma) to 80 years, and 7 patients were over 70. Despite the fact that several patients had cardiac disease, there were no postoperative cardiac complications, except for 1 woman of 77 whose heart decompensated temporarily 1 week after operation. There were no pneumonic complications, no pulmonary emboli, and no chest or peritoneal infections. With the exception of the one death and 3 complications about to be described, the postoperative recoveries were uneventful, and the length of the postoperative stay in the hospital was the same as for uncomplicated lumbar nephrectomies.

As already mentioned, there was 1 death, and 3 complications, 2 of which were from intrapleural hemorrhage, due to the operator's failure to secure adequate hemostasis. The first complication due to intrapleural bleeding was minor in nature, the chest clearing after one thoracentesis. In the second case of intrapleural hemorrhage, persistent bleeding into the chest, probably from torn pulmonary adhesions, necessitated several thoracenteses, as well as blood transfusions, during the first few days after operation. Eventually the blood in

the chest became so thick and clotted that it could not be removed, and it bound down and collapsed the lower and middle lobes of the right lung, making an open surgical decortication necessary. The patient, who was 75 years of age tolerated this procedure well and went home in good condition. The third complication was more serious. The patient was an extremely obese woman of 48 who had been known to have severe arterial hypertension for at least 15 years. Her blood pressure on entry into the hospital was 250/160, and a cardiac consultant considered her only a fair operative risk. She tolerated nephrectomy well, but the evening after operation had a sudden fall in blood pressure to about 80 systolic without signs of hemorrhage. The blood pressure was successfully raised with a blood transfusion and intravenous fluids in a short time, and did not fall again. However on the third postoperative day, she developed right hemiplegia which a neurological consultant thought was due to an infarct in the region of the pons. After 2 weeks, during which time there was no obvious improvement, she was discharged to a hospital for chronic care. This was a month ago. The one death occurred in the fifty-first case. The patient was a man of 62 who had a renal cell carcinoma of the right kidney with a tumor thrombus in the renal vein. The kidney and the renal vein containing the thrombus were removed, but in so doing the vena cava was torn with resulting profuse hemorrhage. Rather than suture the vena cava, the operator elected to ligate it, believing the upper point of ligation to be below the entrance of the left renal vein into the vena cava. Postoperatively the patient suffered from prolonged hypotension with the systolic blood pressure never rising above 80, despite stimulating drugs and replacement by transfusions of more than the amount of blood lost. During the 3 days that this patient lived, there was practically no urinary output. Permission for postmortem examination was not obtained, so the exact cause of death was not ascertained.

Twenty-one cases were operated upon as kidney tumor "suspects" but no tumor was found. These were mostly cases of large solitary cysts, indistinguishable by x-ray from kidney tumors, but there were a few cases where there was some bizarre deformity of the pyelogram strongly suggesting tumor. In a number of these cases nephrectomy was performed, but in cases with obvious cysts, the cysts were merely saucerized.

In discussing the thoraco-abdominal incision, the author has sometimes heard urological surgeons say that, while they admitted that the exposure obtained was phenomenally good, they were a little hesitant about entering the chest and going through the pleural cavity and the diaphragm, feeling that this made the operation complicated technically and might lead to chest complications, and also increase the risk and the shock of the operation. In answer, the author can only say that, although opening and especially closing the chest must be done carefully, the technique is perfectly simple, and can be learned from operating a few times with a thoracic surgeon. The 2 cases of intrapleural hemorrhage in this series were attributable to preventable technical failure to secure proper hemostasis before closing the chest. They occurred rather early in the series, and there have not been any chest complications in the last 50 cases. As to operative shock, with well-trained anesthetists giving intratracheal

ether-oxygen anesthesia, and by taking care not to lag behind in replacing blood loss by transfusions, it has been the experience of the author and his colleagues that shock is minimal, and does not occur at all in the average case. Despite the fact that, in some of the more complicated cases, the operation has lasted several hours and considerable blood has been lost, the element of shock has almost always been surprisingly minimal. The 68 cases in this series were done by 11 different operators, about one quarter of the total having been operated upon by the resident house staff.

SUMMARY

The thoraco-abdominal incision is of great value in certain types of cases in urological surgery (68 cases of author and colleagues).

Its value lies in the remarkably wide open exposure of the infra-diaphragmatic area and the region of the kidney and the adrenal which it affords.

Undoubtedly this incision's greatest usefulness is in the removal of kidney tumors (28 cases). The author feels strongly that the thoraco-abdominal incision should always be used in operating on all kidney tumor cases for the following reasons:

The renal pedicle is ligated more easily and thus more safely.

Preliminary ligation of the renal pedicle before freeing up the kidney blocks the escape of metastases, and makes the tumor's subsequent removal easy and bloodless. Also it eliminates the frequently bothersome hemorrhage from large veins on the surface of the tumor.

The surrounding perinephric fat and capsule of Gerota are removed easily en bloc with the kidney. It is important to do this as they may be involved by direct extension of the malignant disease.

There is plenty of room and exposure to make possible: a) removal of involved regional lymph nodes, b) removal of tumor thrombi from the renal vein or the vena cava, c) any other difficult surgery which may be necessary in order to remove local extension of the disease (e.g. a portion of one lobe of the liver involved by direct extension was removed in 1 case).

The incision has made possible the removal of kidney tumors considered inoperable when approached by the conventional lumbar kidney incision.

At operation, local extension of the malignant disease was found in 54 per cent of the 28 cases, and in half of these cases it was possible to remove the obvious local extension by surgery, which was sometimes quite difficult. In view of this 54 per cent probability of local extension which may require surgery more complicated than nephrectomy alone, the operator must prepare for possible extensive surgery by using that incision giving the widest exposure obtainable.

Although the number of patients is too small and the follow-up period is too short to allow any conclusions of value at the present time, it is the author's firm conviction that the surgical procedures made possible by this exposure will eventually be shown to increase the cures and lengthen the time of survival of patients with kidney tumors.

It has been found that tumors of the adrenal in the adult, except for pheo-

chromocytomas, are best exposed and dealt with by means of a thoraco-abdominal incision (about 12 cases in addition to the 68 urological cases). Pheochromocytomas, because of the wide variation possible in their location, are probably best searched for through an abdominal incision, unless they are seen by x-ray to be in the usual position of the adrenal.

This incision makes nephrectomy possible in cases of extreme scoliosis or kyphosis (2 cases).

For retroperitoneal node dissection in metastatic carcinoma of the testis, the thoraco-abdominal incision gives the best exposure of any incision for dissection in the region of the renal pedicle, the primary site of metastasis (7 cases).

The thoraco-abdominal approach greatly facilitates nephrectomy in difficult cases of calculus pyelonephritis or pyonephrosis (6 cases).

The patients varied in age from 1 year to 80 years. The operation was performed 36 times on the left and 32 times on the right.

In this series of 68 thoraco-abdominal operations, one death occurred in a man of 62 who had his vena cava ligated because of operative trauma and hemorrhage. During the 3 days he lived, his blood pressure was low and he excreted very little urine. Postmortem examination was not done. There were three complications: 1) right hemiplegia on the third postoperative day in a severe hypertensive, blood pressure 250/160; 2) gross and persistent hemorrhage into the pleural cavity requiring thoracenteses, transfusions, and eventually a decortication of the lung; 3) a small intrapleural hemorrhage which cleared up after one thoracentesis. There were no other complications.

With the exception of the one death and the two most serious complications, all the patients did very well postoperatively, and the length of their stay in the hospital was the same as for uncomplicated lumbar nephrectomy.

330 Dartmouth St., Boston 16, Mass.

A FEMINIZING ADRENAL TUMOR IN AN ADULT MALE

HENRY MORTENSEN AND (by invitation) LEONARD MURPHY

From the Department of Urology, St. Vincent's Hospital, Melbourne, Australia

The patient K. S. was a well built man of 38 years of age, married with 3 children aged 12, 7 and 3. Nine years previously he had suffered from mild lead poisoning of short duration. His past history and family history were otherwise unimportant. For years he had been a heavy beer drinker.

The patient, when seen in 1949, presented with gynecomastia. The left breast had begun to enlarge 18 months previously, followed rapidly by the right organ. Breast development had been progressive for 12 months since when their size was unaltered. No secretion had occurred. The patient stated that his breasts became tender during his wife's menstrual periods and that he had suffered from morning nausea and vomiting during his wife's pregnancies though she herself was well.

The patient's second symptom was a pain in the right hip felt deep in the joint, causing a slight limp and unaffected by rest or exertion. This had been complained of for a year, at first intermittent but daily and almost constant of late, and radiating at times to the loin. Loss of libido had been present for a year.

He had noticed no loss of weight or diminution in strength or energy.

On examination, he was of normal masculine physique without adiposity. The breasts and nipples were well developed, corresponding to those of a young adult woman (fig. 1). No secretion could be obtained on attempted expression. The hair distribution was that of a male but comparatively sparse and atrophic in the male pubic area. The penis was tapering and rather smaller than one would expect in a man of his build. The testes were small, soft and atrophic; testicular sensation was normal. The prostate was normal.

On examination of the right hip, there was some limitation of external rotation, other movements being normal.

Hemoglobin and plasma protein estimation and blood counts were normal. Rather low serum sodium values were found, three estimations being 288, 320 and 319 mg./100 cc; two values of the chlorides were 480 and 468 mg./100 cc. The fasting blood sugar estimation was 106 mg. and after 50 gm. of glucose, readings of 110, 83, 85 and 92 mg. were obtained at half hourly intervals. The blood chemistry was otherwise normal as was the renal function. The Aschheim-Zondek test was negative.

Estimation of the 17-ketosteroids showed an excretion of 7.6 mg. in 24 hours.

Biopsy of the breasts was not done and testicular biopsy was unsuccessful as a result of defective fixing agents and was not repeated.

Radiological examinations of the pituitary fossa and chest were negative. Excretory urography showed normally situated and normally functioning kidneys.

Perirenal insufflation of air revealed on the left side an adrenal gland of normal shape, size and density (fig. 2). The shadow thrown by the right adrenal,

while not increased in surface area, was oval and of a density suggesting a rounded tumor.

It is believed that at this stage the diagnosis of adrenal tumor was not fully proved. Against this, were the normal 17-ketosteroid excretion (the significance of which will be discussed later), the fact that in every case collected by Armstrong and Simpson in 1948 a palpable abdominal tumor was present and the many cases of gynecomastia in the recent literature due to hepatic insufficiency, malnutrition, or belonging to the Klinefelter-Reifenstein-Albright syndrome.

It was possible to explain the pain in the right hip by the presence of a bony spur on the upper aspect of the acetabulum revealed by x-ray.

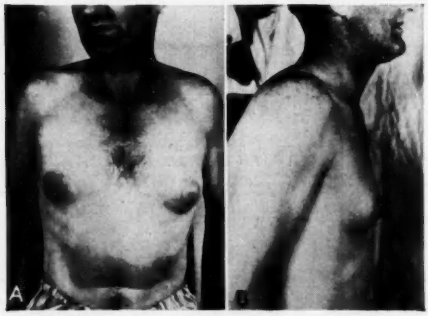

FIG. 1

FIG. 2

The x-rays were sent to Dr. George Cahill of New York for his opinion. The effect of an implant of 100 mg. perandren was tried in the intervening period with resulting return of libido but no alteration in the size of the breasts. The implant was expelled after 3 weeks.

In the next 3 weeks the breasts became painful, the pain in the right loin became much more severe and the patient began to lose weight and it was decided to remove the right adrenal gland. A positive diagnosis of tumor was strengthened by Dr. Cahill's opinion.

Transthoracic removal of a right adrenal tumor was performed. Anesthesia was induced with pentothal and continued with cyclopropane by controlled

respiration. Curare was administered. An incision was made along the length of the tenth right rib which was resected subperiosteally. The pleural cavity was opened through the bed of the rib, the lung elevated and the diaphragm

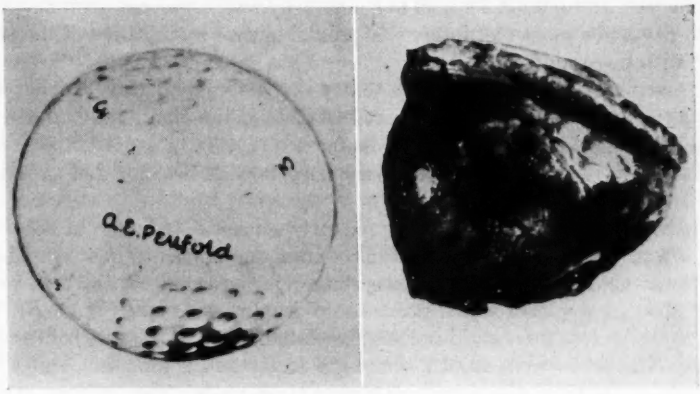

FIG. 3

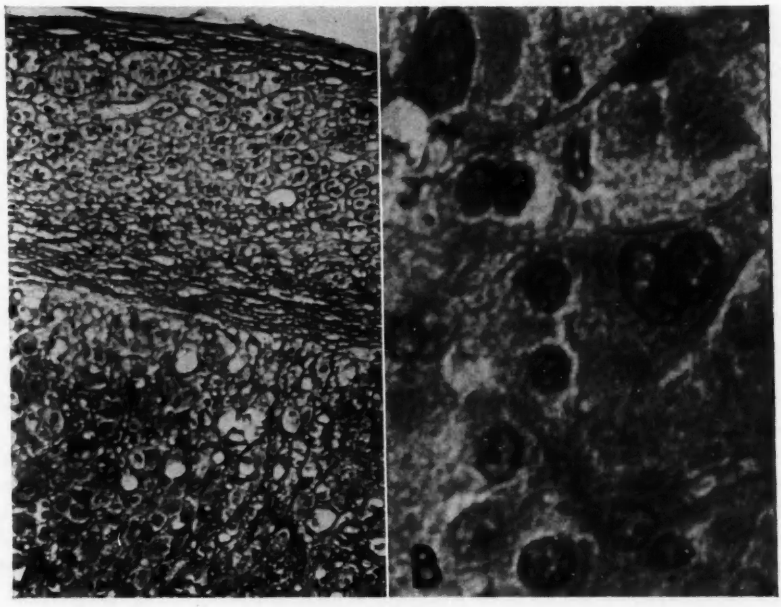

FIG. 4

divided. The peritoneum was opened and the tumor felt above the kidney. No evidence of metastases was found in the liver. The peritoneum was then closed and the tumor exposed by extraperitoneal dissection. The exposure was excel-

lent, the many small short vessels being easily secured. The adrenal was removed and its bed packed with oxycel.

The postoperative course gave little anxiety. No adrenal shock occurred. Mild pyrexia was present for 48 hours. A small hydrothorax was aspirated on the fourth day and a persistent intercostal pain abolished by injection of the affected nerve with novocaine.

On macroscopic examination the tumor was globular, slightly smaller than a golf ball and encapsulated. It appeared to distend the gland and had a ridge of normal adrenal tissue around its circumference (fig. 3).

The cut surface appeared homogeneous, yellowish in color and presented a well defined capsule.

"Microscopically the tumor is apparently encapsulated and in the section there is a narrow rim of adrenal tissue covering one portion (fig. 4, *A*). The cells vary somewhat in size and appearance, some being clear like cortical cells whereas others show protoplasm which stains more deeply with eosin (fig. 4, *B*). There are large cells closely set and in places tesselated. There is very little intervening stroma. Nuclei are well stained, some are larger and some stain more deeply than others. In some cells there are two or three nuclei. The findings are those usually described with either masculinising, demasculinising or feminising tumors." (Dr. Andrew Brenan.)

Within 10 days of operation, the patient noticed a decrease in size of the breasts, which was continuing 10 weeks after operation. His libido has returned and his sexual performance he reports as being "perhaps a little too good."

He has no symptoms referable to his incision, his weight is increasing and he presents no evidence of metastases.

DISCUSSION

Thirteen cases of adrenal carcinomas causing a feminizing syndrome in the male have been previously reported in the literature.

The first case was reported by Bittorf in 1919, 5 cases in the next 20 years, and 8 cases since 1939. It is extraordinary that such a striking syndrome has been recognized and investigated so recently.

The average age of the 14 patients was 32 years. Twelve were aged between 26 and 44 years, and the two exceptions were 15 and 5 years old, this last, Wilkins' case, being the only one occurring before puberty.

Gynecomastia was the only feature common to all cases and it was always prominent. Holl observed abnormal pigmentation of the nipples in his 2 cases, the breasts have elaborated a secretion, milky in the case of Zum Busch and watery in Lisser's case. Depression of libido was noted in the only cases (7) in which remark was made on sexual adjustment. Soft, atrophic testes were present in 7 cases. Loss or thinning of the hair of male distribution was present in 5 cases and suggested in 2 others.

Two patients became obese during their illness but in none was a feminine distribution of adipose tissue developed. Holl's patient returned to normal weight after successful removal of tumor.

Pain in the upper abdomen, loin or scapular region has been present in the majority of cases.

Most cases have been well advanced when first seen. Armstrong and Simpson collected 8 cases in 1948, in all of which a palpable abdominal tumor was present and only one of these was successfully operated upon and apparently free of metastases 12 months later.

The two most recently reported tumors have been the smallest; in Wilkins' case, the neoplasm was 3 cm. in diameter, approximately the same size as the tumor here reported.

Lisser's case is of interest in that at autopsy, the adrenal and kidney were separable from the tumor which apparently arose in a retroperitoneal adrenal rest.

Hormonal studies have been made in 6 cases. A minor rise in androgen excretion was noted in the 2 cases in which estimation was done (Simpson and Holl; Roholm and Teilum). In the same 2 cases, in both of which the patients died, gross increase in estrogen excretion was found. However, in the also unsuccessful case of Scott, there was no rise in urinary estrogens and a similar finding was made in Wilkins' surviving case. These tests thus do not appear to be of great help in diagnosis.

17-ketosteroid estimations are available in 4 cases. In Scott's case, the high value of 195.6 mg. daily was found prior to operation, and of this 70 mg. was in the form of dehydroisoandrosterone. After removal of the tumor, the 17-ketosteroid excretion fell to 9.6 mg., the alpha ketosteroid predominating; there were no 17-ketosteroids on analysis of the tumor. In the case of Armstrong and Simpson, with a palpable tumor, 17-ketosteroid excretion was 34 mg. and 4 months later 108 mg. In Wilkins' successful case, 4 mg. 17-ketosteroids was considered slightly greater than normal for a boy of 5 years and in my case, 7.6 mg. was a normal value.

In virilizing tumors in the female, 17-ketosteroid and dehydroisoandrosterone estimations and the color tests are of considerable value in diagnosis. In the four feminizing tumors detailed above, significant findings have occurred only in cases beyond surgical help.

The high degree of malignancy of these tumors is shown by the few long term survivors. In 6 cases the patients died of metastases without surgery, 2 were found to be inoperable at laparotomy. Two cases in which the primary tumor was removed died soon of recurrences. Four cases have survived excision of the tumor and been free of metastases at the time of the report namely at 6 weeks (McFadzean), 6 months (Holl, case 2), 4 years (Wilkins), and 3 months* in my case.

All 4 so far successful cases have shown regression of breast development and return of libido.

SUMMARY

The fourteenth reported case of feminizing tumor of the adrenal in the male is here presented.

* The patient has since been reviewed 5 months postoperatively and is symptom free.

The ease of approach to the adrenal through a thoraco-diaphragmatic incision is demonstrated.

This is the fourth case recorded surviving excision of such a tumor and free from metastases at the time of report.

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DISCUSSION

DR. GEORGE F. CAHILL (New York, N. Y.): The rare cases in urology often in the past have proved to be of great value in leading the way of investigation.

In these last two pheochromocytomas, a series of principles have been shown. First, the experience with a drug that combats the endocrine effect of the tumor as well as its use in diagnosis. In this effect, with lowering of blood pressure temporarily by its action upon the vessel walls through muscle nerve endings, there was apparently secondarily produced a partial destruction of the tumor apparently by vascular thrombosis. This effect could be repeated several times, improving the patient and destroying the tumor. Then when the patient's condition made operation feasible the tumor also was rendered inactive and made removal simple. The agent formerly widely used for this purpose had been x-ray, but it is of little effect so far in adrenal tumors.

As yet we have no corresponding chemical to affect the hormonal cortical tumors such as those that produce the Cushing's syndrome, but at least we have now the proper replacement hormone to tide these cases over their deficiency period.

With nor-epinephrine the most recent hormone of the sympathetic adrenal medullary cells described we have an agent to tide over the pheochromocytoma during its deficiency period.

In discussion of the thoraco-abdominal incision paper by Dr. Chute, may I call attention to the fact that this approach had been used by Brostner for adrenal surgery in 1935 and so reported in his publications.

Mr. Mortensen's extraordinary case should be remembered. It again confirms the experience of recent investigators that these tumors produce various types of hormones, some with estrogenic effect. In fact, the first case reported by Frank, a female with masculinizing changes was shown to excrete large amounts of estrogens. It seemed unacceptable at that time, but has since been proven to be such. Of course at that time there was no useful test for androgens. In the last paper I read before this section I reported 4 cases of children, all with high androgens and male masculinizing changes, but all also excreting very large amounts of estrogens. Yet the estrogens apparently had no clinical effect upon the children, the secretion apparently being overshadowed by the androgens. This seems to be a contradiction to our experience in prostatic carcinoma in which we can register an estrogenic effect with synthetic estrogens. Apparently often the tumor estrogens appear to be inactive within the individual. In Mr. Mortensen's case they were active. He calls attention to the fact that the A–Z test was negative. So it should, because the prolans are the product of placental cells and as yet there have been no placental cells or hormone identified with the adrenal. They occur in the testes and female genital organs.

One further item may be mentioned, and that is the speed of aid. Mr. Mortensen sent the history and x-rays from Melbourne to New York and they arrived in 7 days. I concurred in his diagnosis and immediately returned to him in 7 days all by air mail of course. His air insufflation films were excellent and showed their

value in tumors too small to be shown by any other method at present, and I have been pleased to think that his diagnosis was correct, his therapy excellent, and that we compliment him on both.

DR. HOWARD: What would have happened to that tumor if you had continued your dibenamine? You didn't tell them that.

DR. CAHILL: We did not continue beyond the period described; later experience may show how far we may go in the chemical inhibition of these tumors.

DR. WYLAND F. LEADBETTER (Boston, Mass.): I wish to present a case that gives good support to Dr. Chute's contention with respect to the thoraco-abdominal incision and also add another case of feminizing adrenal tumor in a youngish male which was first diagnosed in 1945. An excision of the tumor was done at that time. This was followed by complete disappearance of symptoms. During this past year, that is 4 years after operation, the symptoms began to recur. There was enlargement of the breasts, changes in facies and body contour, impotence, elevation of the urinary ketosteroids to a level of 90 mg. per cent.

An interesting commentary on this was that at the time of the first operation silver clips were put on the vessels in the region of the pedicle of the tumor. Over a period of years, the clips could be seen to spread or separate. This brings up a point of technique which might be utilized in demonstrating early recurrence of tumor. If we were to use clips, sometimes recurrence might be indicated by the spreading of the clips before any physiological or systemic signs developed.

(Slide) This slide gives a summary of the findings in this case. It will be noted that in 1945 there were enlarging breasts, facial acne, weakness and fatigue, polyphagia, and increasing weight. Testicular atrophy and impotence were present. A somewhat tender mass could be felt in the right flank. Urinary ketosteroids were between 40 and 70 mg.

(Slide) You will not be able to see this well, but there is a rounded mass above the upper pole of the right kidney. The clips will probably not be visible. This is 5 years after removal of the original tumor.

(Slide) This is the picture of the individual taken after this last operation. The changes demonstrated here have regressed a great deal since the operation. It will be noted that the healing thoraco-abdominal incision can be well seen.

(Slide) This slide shows the tumor mass involving the upper pole of the right kidney. The slides are poorer than I would have liked because they were taken from colored photographs. This demonstrates, I think, the value of the thoraco-abdominal incision in this type of case, since this slide shows as well as the primary tumor mass, implants which were removed from the diaphragm. You can see these two discrete tumor masses, and in addition a large tumor mass removed from the right lobe of the liver which is well illustrated. We were able to take this out in its entirety. I am sure that had we not used the thoraco-abdominal incision in this case we would have been unable to complete the operation, which, as it was, was a very difficult job. A portion of the tumor extended behind the vena cava very high up under the diaphragm. This patient made a very satisfactory though slow convalescence and his symptoms have regressed gradually.

We hope that he will have a reasonable period of palliation. It is too much to expect that he is cured.

(Slide) This shows the microscopic appearance of the tumor, the lower half being the high power and the low power shown above.

DR. RICHARD CHUTE (Closing): I would like to thank Dr. Cahill and Dr. Leadbetter for their discussions.

Two years ago at the meeting of this society, when Dr. Soutter and I reported our first cases, Dr. Ormond asked me why we crushed the phrenic nerve, and I answered him that we felt, as the chest surgeons did, that it stilled the bothersome motion of the diaphragm and made it heal. Since then, we have abandoned doing that, because one is working right through the diaphragm and it doesn't bother at all by its contractions, and also it seems to heal perfectly well. I thought you would be interested in the followup on that.

LYMPHANGIOMA OF SPERMATIC CORD: REPORT OF TWO CASES

JOHN K. ORMOND AND ORMOND S. CULP

From the Henry Ford Hospital, Detroit, Mich.

Cysts involving the spermatic cord and scrotal contents may be divided into five groups, according to their origins.

1) Commonest are those rising from the peritoneal prolongation, which include all the true hydroceles. These hydroceles are of several kinds: simple hydrocele of the testis with complete obliteration of the peritoneal extension to the testis; simple hydrocele of the testis and cord, open or closed at the internal ring, involving all or only part of the cord depending on the degree of obliteration; bilocular, with part in the abdominal cavity; and multiple cysts of the cord due to either interrupted areas of obliteration or to inflammatory adhesions. Hydrocele of an old hernia sac is reported but is very uncommon.

2) Cysts of the epididymis. These are of two kinds: retention cysts filled with spermatozoa (spermatoceles), and simple serous cysts.

A spermatocele is a true retention cyst of an aberrant tubule of the rete testis, or, more commonly, of the head of the epididymis, or may arise as the result of obstruction of a tubule which has become distended with semen and dilates. There are two clinical types of spermatocele: intravaginal, occurring between the testis and the epididymis; and extravaginal arising above, and, when large, indistinguishable from hydrocele except by the character of its contents.

Serous cysts may be multiple, are usually small, and are said to arise from the visceral layer of the tunica vaginalis (rarely from the albuginea) and are only important in the differential diagnosis of testicular tumors. Their removal entails removal of the epididymis. Similar to these are cysts arising from the albuginea of the testis proper.

3) Cysts of the foetal remains, müllerian duct and wolffian body: These include the paradidymis or organ of Giraldes, the ducts of Kobelt, the appendix testis and the appendix epididymis. Small cysts of the appendix testis are not uncommon, but the others are rare.

The müllerian duct cysts except for cysts of appendix testis are seen at the prostatic end. The intervening duct is completely obliterated, though theoretically it should be possible for a cyst to arise along its course.

4) Hematoceles, almost invariably due to trauma.

5) Miscellaneous rarer conditions: Echinococcus cysts: filariasis; dermoid cysts; hemangiomas; and lymphangiomas.

We are reporting here 2 cases that belong to the last group. They were remarkable in that their prompt recurrence necessitated another operation less than a month after the first in each case, and their probable nature was not suspected until these recurrences.

CASE REPORTS

Case 1. H.F.H., No. 503826, a 2½ year old boy, was seen in urology for the first time on November 28, 1949 at which time the parents claimed that there had

been swelling of his scrotum for one year. The patient had been delivered at the Henry Ford Hospital on March 24, 1947, was circumcised before leaving the hospital and had been considered normal. He was admitted with acute tonsillitis from September 14, 1949 to September 16, 1949, at which time the scrotum appeared blue and was approximately 3 times normal size.

He was admitted on the urologic service November 30, 1949. Both testes were palpable deep in the scrotum. The contents on the right seemed entirely normal. The left side was about three times normal size, bluish, and it transilluminated. The swelling extended to the external inguinal ring which was dilated but no actual hernia could be demonstrated. The remainder of the physical examination was essentially negative.

Preoperative diagnosis: Left hydrocele with possible bleeding.

On December 1, 1949 operation was performed by Dr. Culp. The left scrotal contents were exposed through a low inguinal incision under ether anesthesia. The spermatic cord was surrounded by a large amount of fat and numerous small bluish-brown cysts that extended to the external ring and also toward the midline in the presymphyseal area. The inguinal canal was opened, the cord was identified and freed easily and exploration revealed no hernia. The small cysts in the upper scrotum varied from 0.5 to 1.5 cm. in diameter and were excised along with much of the presymphyseal fat on the left side.

The scrotal contents were delivered by combined sharp and blunt dissection and one large cyst about the size of a golf ball was found below the testis and epididymis. It was opened during delivery and proved to be multilocular and very vascular. There was no connection with the testis or epididymis. The tunica vaginalis was opened, the contents appeared normal in every respect and the excess tunica was excised. No attempt was made to explore the depths of the scrotum.

Study of the surgical specimen (No. 110639) showed that the largest cyst weighed 9 gm. The wall was thin, smooth and glistening. Microscopically the wall consisted of heavy collagenous fibrous tissue in which there were many thin-walled veins. The lining consisted of flat mesothelial cells (fig. 1, *A*).

The postoperative course was uneventful. There was minimal edema on the left side of the scrotum and the patient was discharged on December 8, 1949 (8 days postoperative) with the incision healed.

Five days later (December 13, 1949) he was back in the out patient department with further blue discoloration on the left side of the scrotum. Within the subsequent week it became the size of a hen's egg, fluctuant, and transilluminated. There was no evidence of hernia. The enlargement was confined to the scrotum and no swelling could be found near the symphysis.

He was readmitted on urology on December 27, 1949. Two days later the left side of the scrotum was opened under ether anesthesia. Just under the scrotal skin a large cavity filled with dark bluish-brown fluid was entered. In the depths of this sac the testis was well preserved but adherent. The anatomical arrangement resembled the cavity of a hydrocele of the tunica vaginalis but the tunica had been excised at the previous operation.

The evacuated fluid was centrifuged and the sediment was studied microscopically. It consisted of innumerable red blood cells, a few white blood cells and much fibrin.

The entire sac was excised after which numerous minute, opaque and brownish cysts were found deeper in the scrotum and extending into the perineum. These were embedded in copious fatty tissue. Further dissection included excision of the scrotal septum and all of the cyst-bearing tissue of the perineum. The right tunica vaginalis was exposed but not opened.

Histologically (No. 111187) the walls of the cyst showed cellular fibrous tissue in which there were many dilated, thin-walled veins. The linings were not preserved well enough for adequate study.

The convalescence was uneventful and the patient left the hospital on January 4, 1950 (6 days postoperative).

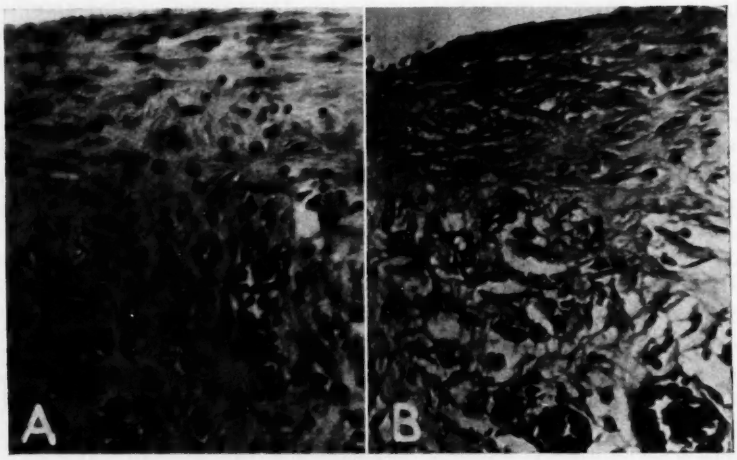

FIG. 1

One month later (February 6, 1950) no recurrence had taken place and the child was asymptommatic. The testes were in good position. The right was freely movable, while the left seemed to be fixed to the scrotal wall.

Case 2. H.F.H., No. 512649. The child was not born at the Henry Ford Hospital but had been followed by the department of pediatrics since the age of 3 months for feeding and general care. He was first seen by the division of urology at the age of 28 months at which time it was thought there was a hydrocele of the cord probably communicating with the peritoneal cavity. The parents wished to have this remedied and he was admitted for operation five months later at the age of 33 months. He was a well developed, well nourished child with no abnormalities found in the physical examination except the enlargement in the region of the left cord which was soft and transmitted light. There seemed to be no testicular hydrocele and no hernia could be detected.

Operation was performed by Dr. Ormond on January 7, 1950. Incision was

made in the left inguinal region above the inguinal ligament—as for a hernia operation, eventually the external ring was incised and the testicle and cord delivered into the wound. There were found a series of cysts of different sizes running from the gubernaculum to the internal ring. These were incised and dissected out in so far as possible. There was very little fluid under the tunica vaginalis. Also there was no hernia and the cysts did not communicate with the abdominal peritoneum. The testicle was replaced in the scrotum and the wound repaired as in the operation for hernia.

Recovery was uneventful except that on discharge 10 days later, the left side of the scrotum was much enlarged, slightly bluish in color and transmitted light. Previous to operation the scrotum had not been enlarged. There was evidently recurrence of cysts, so he was readmitted to the hospital and a second operation performed on January 24, 1950, seventeen days after the first one.

At this time the left side of the scrotum had increased greatly in size. Incision was made in the scrotum and run up into the inguinal region. There was found to be a cyst bearing, fibrous mass of tissue involving part of the scrotal septum, gubernaculum, tunica vaginalis and running up the cord. In dissecting this cyst bearing tissue from the cord, etc., the corpus cavernosus was exposed near the penoscrotal junction.

Following this operation recovery was uneventful and to date there has been no recurrence.

In neither the tissue removed at the first operation nor in the second, was the lining of the cysts preserved enough for microscopical diagnoses (fig. 1, *B*).

In both of these cases, we have made the diagnosis of lymphangioma, as much on the clinical data as on the microscopic findings, and in this diagnosis Dr. Frank Hartman concurs. These are classed among the rarer conditions, but since the tissue removed at the time of operation for such cysts may be subjected to only perfunctory scrutiny—such tumors may be more common than would appear from a search of the literature.

In Moore's *Textbook of Pathology* it is stated that cystic lymphangiomas occur in the neck and in the inguinal region. Tumors vary from a few small cysts to large masses. On dissection numerous small and large, thin walled cysts filled with a clear straw colored or colorless fluid are seen. Between the cysts there is a small amount of fibrous tissue. Microscopically the cysts are seen to be lined with flattened endothelium which rests upon a moderately collagenous connective tissue. It is highly probable that this tumor originates from some anomaly in the development of the primitive lymphatic spaces. It is commonest in children, on the right rather than on the left and in girls rather than in boys.

A peculiar neoplasm of the serosal layer of the tube and of the epididymis is variously termed lymphangioma, mesothelioma or adenomatoid tumor. (Moore's *Textbook of Pathology*.)

Ewing mentions filariasis of the scrotum but says nothing of lymphangioma.

In *Kaufmann's Pathology*, translated by Reiman, lymphangiomas in general are circumscribed tumors consisting of netlike connected capillary and larger lymph vessels. Cavernous lymphangiomas consist of larger lymph spaces lined

with endothelium and surrounded by more or less firm fibromuscular walls. The classic example is macroglossia. Cystic lymphangiomas, or hygromas, consist of cysts, simple and divided, lined with endothelium. The contents are serous, milky or chocolate colored.

Watson and McCarty in 1940 reported on 1056 cases of blood and lymph vessel tumors. In discussing cystic lymphangioma or hygroma, they stated that it may occur in the groin and be multilocular, lined with endothelium and filled with serous fluid. They made the interesting observation that they show a remarkable tendency to recur.

Lymphangiomas are much less common than hemangiomas and are reported in the mesentery, omentum and internal organs such as spleen, liver, intestines, pancreas, broad ligaments, etc., but are most frequent in children in the neck, axilla and groin. In the groin they are oftener found associated with the round ligament in girls, than with the spermatic cord in boys. Treatment has been by radiation, injection of sclerosing fluids, carbon dioxide snow, cauterization and surgical removal. The mortality of those in the neck and tongue has been quite high due to infiltration of the tumor, its remarkable tendency to recur and to extend, and infection. A common complication has been lymphorrhoea.

Those in the groin are apparently much less dangerous and more amenable to surgical removal, which is the usual method of treatment.

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LUXATION OF THE TESTICLE

DONALD A. CHARNOCK

Luxation of the testicle is the accepted term designating traumatic dislocation of the normally descended organ. The first recorded case was published in 1818.[1] Since this time only sporadic reports have appeared in the literature. In 1929, Alyea made a review of these cases from the year 1800 and brought to light only 23 original reports to which he added two of his own.[2] In 1936, Herbst and Polkey, stimulated by a case entering their clinic, were able to find 93 reports which they considered as falling within this classification.[3] While there is considerable question about accepting all of these cases as true traumatic luxations, the statement that the condition is an exceedingly rare occurrence is attested by their studies.

The testes lie in the scrotum loosely suspended by the spermatic cord and the surrounding fibers of the cremaster muscle. Some support is derived from the intercrural and infundibuliform fascias. The scrotum itself is made up of a thin, easily mobile integument which covers the dartos fibers of unstriped muscle. Contraction of these smooth muscle fibers results from various stimuli. Contractions of the dartos must not be confused with those of the cremaster muscle. The cremaster reflex affects the testicle and not the skin of the scrotum.[4] Direct trauma, sudden violent muscular effort or continued pressure against the testicle may result in its excursion to an abnormal position. The line of migration depends upon the force and direction of the blow, the length of the spermatic cord and the anatomical variations of the pathways along which the testicle progresses.

In view of the increasing incidence of severe pelvic injuries, particularly of the run-over type, it is surprising that this condition is not more frequently encountered. The facility with which the testicles escape injury, due to their mobility and the structure of their covering, has been noted by numerous writers. The protective mechanism of fear and emergency, with its resultant effect upon involuntary muscle fibres, may very well explain nature's effort to protect these vital organs.

Alyea in discussing the course of testicular migration suggests three possible pathways:

1) The internal group in which there is a relaxation of both the neck of the scrotum and of the external inguinal ring. This allows the testicle to be forced into the inguinal canal. There is the possibility of the organ's being forced through the canal into the abdomen and perhaps down into the femoral canal. Several cases have been reported in which the testicle was found within the in-

[1] Claubry, E.: J. gen. med. chir. et phar., Paris, **64:** 325, 1818.
[2] Alyea, E. P.: Surg., Gynec. & Obst., **49:** 600–616, 1929.
[3] Herbst, R. H. and Polkey, H. J.: Am. J. Surg., **34:** 18–33, 1936.
[4] Hinman, F.: Principles and Practice of Urology. Philadelphia: W. B. Saunders Co., 1935.

guinal canal. Herbst and Polkey record 2 cases of the migrating organ entering the abdomen. None have been found within the femoral canal. One unusual case reported by Jurinka in 1904[5] describes a run-over accident in which the dislocated testicle was found within the hip joint. See figure 2.

2) The superficial group in which the testicle meets obstruction at the external inguinal ring and does not pass through but is diverted subcutaneously into

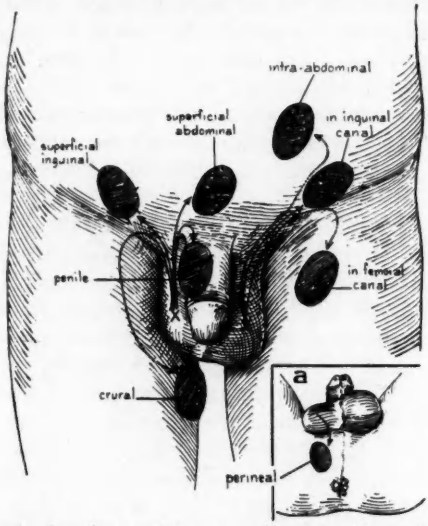

FIG. 1. Pathways of migrating testicle, as outlined by Alyea. Surg., Gynec. & Obst. 49: 600, 1929.

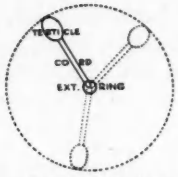

FIG. 2. Diagram of limitations of migration

any position on the circumference of a circle, the hub of which is the external ring and the diameter the length of the cord. In this group we find the superficial inguinal, pubic, perineal, penile, and crural types. These are the more common locations. See figure 2.

3) Compound dislocations in which the testicle meets a tight scrotal neck which impedes upward progress resulting in a herniation of the organ through the scrotal wall. A number of these cases have been collected. See figure 3.

Herbst and Polkey have discussed the mechanics of testicular migration and have carried out experimental studies on dogs and human cadaver material. They found no difficulty in causing a migration of the testicle to an abnormal position

[5] Jurinka: Zentralbl. f. Chir., **31:** 1100, 1904.

but stressed the fact that the fascial coverings of the testicle must be injured to result in a permanent fixation in the anomalous location. Their classification of migratory routes corresponded with those of Alyea.

Ockuly, in reporting a case of bilateral luxation occurring in a military accident during the recent war, objects to the inclusion of scrotal injuries, with resultant herniation of the testicle through the scrotal wall, within the classification of luxation of the testicle.[6] He believes that this term should be reserved for cases where "a previously normally located testicle assumes a nonscrotal position by being forcibly propelled through normal anatomical apertures or along fascial planes." I believe his point is well taken. In the interests of simplicity the

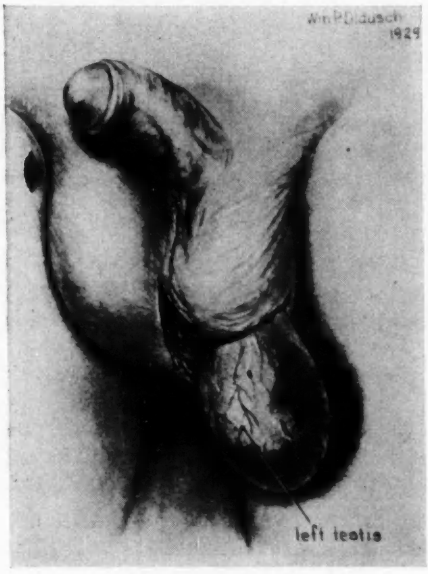

FIG. 3. Hernia of testis. After Alyea

term herniation of the testicle should be used for those cases in which a break in the scrotal wall allows the testicle to lie outside the body.

Luxation of the testicle should be limited to: 1) the superficial group, in which the organ is forced to its new location along fascial planes, and, 2) the internal group, where the gland is forced into the inguinal canal and possibly the abdomen.

This condition must at once be differentiated from congenital anatomical anomalies of cryptorchidism and ectopic migrations of the testis. These are present at or develop shortly after birth. Luxation of the testis occurs to a normally descended organ and the change of location is the result of either trauma or muscular effort.

The case to be reported is that of a 40-year-old truck driver who was knocked

[6] Ockuly, E. A.: Am. J. Surg., **71**: 93-95, 1946.

down and run over by a lumber yard truck. The patient sustained multiple fractures of the right leg and pelvis together with numerous abrasions and severe contusions to the soft tissue over the inguinal canal and thigh. On entry to the hospital it was noted that the right testicle was not present in the scrotum.

Because of the serious fractures and soft tissue injuries, no further consideration was given to the absent organ.

The patient made an excellent recovery. Numerous skin grafts were necessary to repair the abraded areas. After the dressings were finally removed, the patient, quite naturally, engaged in a personally conducted inventory to establish his physical status quo. He made the distressing discovery that his right testicle was missing from the scrotum. His physician reported to him that on entry to the hospital no testicle was present and that examination had failed to locate the missing organ. Urologic consultation was authorized and a small globular mass was palpated in the area of the midportion of the inguinal canal. This was painfu

FIG. 4. Superficial inguinal luxation indicating site of testicle as found at surgery

to pressure and was thought to be an undescended right testicle. Palpation of the external inguinal ring was difficult at the time due to the freshly healed tissue. The scrotum was normal in appearance and not atrophic, as is usual in cryptorchidism or congenital ectopic testicle.

As the patient became more active he complained of pain in the groin on flexing the leg. This was dull and aching in character and increased in severity as the day progressed. It was not referred. There was no abdominal or loin pain. The patient insisted that the testicle was present in the scrotum prior to the accident and in this he was corroborated by his wife. As the discomfort interferred with his rehabilitation, an exploratory operation was authorized by the insurance carrier.

At operation an incision was made parallel to and directly over the inguinal canal. As the subcutaneous tissue was dissected free, the testicle was found lying upon the aponeurosis of the external oblique with the lower pole pointing upward. The tunica vaginalis was intact. The cord was free and entered the exter-

nal inguinal ring at a rather acute angle. There was no obstruction to the blood supply. The testicle and epididymis were intact. The testicle was slightly reduced in size. It was rather firmly bound to the aponeurosis by a light covering of adhesions. These were easily freed and the testicle and epididymis were re-introduced into the scrotum, which required only manual opening. A Torek fixation was done to insure the testicle remaining in the scrotum. The wound healed rapidly and a month later the Torek flap was released. The patient was discharged as cured.

These cases are rare, but due to an increase in run-over accidents they should be encountered in greater numbers. The diagnostic point to be stressed is the normal empty scrotum. This differentiates the condition from cryptorchidism and ectopic migration of the testis, in which the scrotum is almost invariably atrophic. Diagnosis is frequently hindered by damage to soft tissue, the presence of hematoma, and by edema. In severe accidents the shock and more serious injuries overshadow the abnormal position of the testicle.

Treatment of these cases varies with the length of time between injury and diagnosis. Manual reduction is possible in early cases where edema and injury will allow. When the testicle remains in its abnormal location for a longer time there rapidly develops a covering of adhesions which requires surgical reduction. In the cases recorded these have been highly successful.

727 W. Seventh St., Los Angeles, Calif.

DISCUSSION

DR. LEON HERMAN (Philadelphia, Pa.): Dr. Charnock did not mention any of the medico-legal aspects of these injuries. Sometime ago, there was a case in Philadelphia in which a youngster, sitting in an automobile, was alleged to have been pushed forward as the result of a trolley car hitting the automobile, as a result of which he was supposed to have luxated his testicle. I was asked to examine this boy. He was obviously a unilateral cryptorchid.

The case came to trial. My brother happened to be the attorney for the trolley company, and I had taken the prostate out of the judge, so I thought I was in a rather friendly atmosphere. I said, "Judge, might I be permitted to explain this situation, just as I might lecture to my students?" He said, "Go ahead; Dr. Herman likes to talk and we don't mind listening to him briefly." So I told them the story. I told about atrophy of the scrotum and the absence of an external ring. And the jury gave the boy full damages!

DR. DONALD A. CHARNOCK (Closing): Dr. Herman asks regarding the medico-legal status of cases of luxation of the testicle. In the earlier reports there was no mention made of any medico-legal involvement. The whole problem of medico-legal action dates back only a few decades. The recent cases which have been reported have resulted mainly from accident, particularly of the run-over type. Almost all of these cases would fall within some medico-legal classification. The case which we have reported was cared for by the compensation insurance carrier. Because of the satisfactory outcome, no further involvement ensued.

Answering Dr. Van Capellen's question about the lack of the gubernaculum as an etiological factor in luxation of the testicle, I can only say that there is still considerable question about the exact role of the gubernaculum. In this case there was a small remnant of the gubernaculum present. Whether or not it was tightly adherent to the bottom of the scrotum cannot be determined as we saw this case many months after the original accident. If the gubernaculum were well attached to the bottom of the scrotum, there would be less chance of the testicle changing position.

I believe that the elimination of the compound dislocations from this classification of luxation of the testicle will do much to clear up the controversy regarding these cases. There are a lot of accidents in which an injury to the scrotum will allow the testicle to be extruded. In my opinion, this does not constitute a direct luxation, in which there is a direct blow upon the scrotum, which results in the movement of the testicle to a new location. .

It would require a jury of experts to pass upon each case presented in the literature, eliminating such cases as presented insufficient data. I have found 28 to fall within the internal group, 27 of these having passed into the inguinal canal and one having worked its way into the hip joint. In the superficial group, 35 have been accepted, making a total of 63 cases.

HYDRONEPHROSIS IN INFANTS AND CHILDREN

MEREDITH CAMPBELL

From the Department of Urology, New York University-Bellevue Medical Center, New York, N. Y.

Hydronephrosis is the commonest abdominal tumor in infants and children and is most often recognized by complete urologic examination performed because of persistent pyuria—so-called chronic pyelitis. In many cases of mild asymptomatic urinary infection perpetuated by unidentified hydronephrosis, an acute exacerbation of the infection results from sudden increase in the urinary obstruction which initially caused the hydronephrosis. Yet an acute infection elsewhere (nasorespiratory, cutaneous, infectious disease) may engender metastatic exacerbation in the injured kidney or by toxic trauma increase the renal debility and lower the local resistance. This induces the clinical picture too commonly designated as acute pyelitis and which, continuing, becomes "persistent acute pyelitis." In some instances the urinary infection is an accidental finding when recurrent gastro-intestinal symptoms for example, are under investigation and routine analysis of a casually collected urine specimen is made. Yet urinalysis may be essentially normal and the urine sterile in the presence of advanced hydronephrosis and grave urinary obstruction. In the present communication the pertinent considerations in 828 cases of hydronephrosis in infants and children are presented; in this series the condition was discovered at autopsy in 316 cases and in 512 was disclosed by urologic investigation.*

ETIOLOGY

Age. The ages of the infants and children reported are shown in table 1 in which it will be noted that in those examined post mortem and those examined clinically, the incidence of hydronephrosis upon the basis of congenital malformations is extremely high, especially in the group less than 1 year of age. Moreover, the condition is frequently either the direct or an important associated cause of early death. Eighty-one per cent of the autopsy group were 12 months of age or less as were 22.2 per cent of the clinical cases with a combined average of 44.7 per cent or nearly half. Not until the fourth decade do the clinical manifestations of hydronephrosis assume comparable importance.

Sex. As shown in table 2, in infants and children hydronephrosis appears to be slightly more frequent in females. In the evaluation of the autopsy findings in this series, however, twice as many males as females were thus examined, while in the clinical group the male:female ratio is 2:3.

Side involved. The occurrence of hydronephrosis is slightly greater on the left side but in nearly half (43.4 per cent) of the cases the lesion is bilateral and commonly the result of lower urinary tract obstruction (table 2). While obstruc-

* The statistical summaries recorded here are based on 1) the study by the author of 47,483 autopsies, of which 15,919 were in infants and children (Campbell: Clinical Pediatric Urology, W. B. Saunders Co., Philadelphia, 1951—in press), and 2) 512 infants and children with hydronephrosis personally examined and treated.

tion at or peripheral to the bladder outlet usually accounts for advanced bilateral involvement (table 5), in a surprising number of cases the etiologic factor is bilaterally supravesical and chiefly ureterovesical junction stricture, ureterocele, or ureteropelvic junction blockage by stricture, aberrant vessel, or angulation, and in the order named. Yet combined or multiple obstructions are not uncom-

TABLE 1. *Hydronephrosis in infants and children. Ages in 828 cases*

AGE	SEX	AUTOPSY (15,919) 316 cases	CLINICAL 512 cases	TOTAL 828 cases
0–6 mo.	M	148 (10,712)	21	169
	F	57 (5,207)	40	97
7–12 mo.	M	39	22	61
	F	12	31	43
13–36 mo.	M	18	46	64
	F	17	78	95
3–6 yr.	M	9	56	65
	F	5	85	90
7–10 yr.	M		28	28
	F		65	65
11–15 yr.	M	6	24	30
	F	5	16	21

TABLE 2. *Hydronephrosis in infants and children. Etiology in 828 cases*

	AUTOPSY (15,919) 316 cases	CLINICAL 512 cases	TOTAL 828 cases
Side Involved			
Right	67	175	242
Left	75	152	227
Bilateral*	174	185	359
Sex			
Male	240	197	437
Female	76	315	391
Location			
Supravesical			
Unilateral	152	322	474
Bilateral	108	102	210
Infravesical†	56	88	144

* Including infravesical obstruction.

† Hydronephrosis: Unilateral 16; bilateral 36. With supravesical obstruction: Unilateral 7; bilateral 5.

mon, for example, contracture of the vesical outlet and ureterovesical junction stricture, or ureteral obstruction with secondary vascular blockage. In the tabulation here the primary or proximal blockage is the one recorded.

The numerous conditions both congenital and acquired which may produce hydronephrosis are shown in tables 3 to 6. Here it will be noted that urinary stasis and/or obstruction often results from neuromuscular disease of the urinary

TABLE 3. *Congenital and acquired lesions causing urinary obstruction in children*

I. Urethra
- a. Congenital or acquired
  - Phimosis
  - Meatal stenosis
  - Meatal atresia
  - Stricture
  - Cysts
  - Diverticulum
  - Hypertrophied verumontanum
  - Hydrocolpos
- b. Congenital
  - Posterior urethral valves
  - Penile torsion
  - Abnormal openings
    - Epispadias
    - Hypospadias
- c. Acquired
  - Polyps
  - Trauma
  - Calculi
  - Tumor
  - Extra-urinary masses, cysts, etc.

II. Bladder
- a. Congenital or acquired
  - Contracture of vesical neck
  - Hypertrophy of vesical neck
  - Median bar
  - Median lobe
  - Hypertrophy of inter-ureteric ridge
  - Diverticulum
  - Neuromuscular disease
    1. Cord bladder
    2. Atonic bladder
- b. Congenital
  - Anomalies: Exstrophy, reduplicated, bipartate, etc.
  - Trigonal curtain obstruction
  - Ureterocele
  - Hydrocolpos
- c. Acquired
  - Tumor
  - Prostatic enlargement
  - Prostatic neoplasm (sarcoma chiefly)
  - Calculi
  - Foreign bodies
  - Extravesical masses (sacral teratoma, anterior sacral meningocele, sacro coccygeal chordoma, hydrocolpos, hematocolpos, etc.)
  - Rectal distention by feces, appendiceal abscess, etc.

III. Ureter
- a. Congenital or acquired
  - Stricture
  - Stenosis
  - Atony
  - Spasm
  - Cystic dilatation
  - Kinks
  - Angulations
  - Diverticulum
  - Herniation
- b. Congenital
  - Anomalies of number
  - Anomalies of termination
  - Valves and folds
  - Ureterocele
  - Vascular blockage
    1. Primary
    2. Secondary
  - Torsion
  - Retrocaval

TABLE 3—(*Continued*)

III. Ureter—(*Continued*)
- c. Acquired
  - Calculus
  - Inflammation
    - Ureteritis
    - Peri-ureteritis
  - Long-standing infection
  - Blood clots
  - Trauma
  - Ligation
  - Tumor
  - Extra-ureteral masses, fibrous bands or enlarged glands which compress the ureter
  - Fecal distention of rectum

IV. Pelvis and kidney
- a. Congenital or acquired
  - Abnormal ureteral insertion
  - Stricture at pelvic outlet
- b. Congenital
  - Renal anomalies of number, form, location, size, etc.
  - Accessory renal vessels
- c. Acquired
  - Calculus
  - Pelvic outlet blockage by intrarenal or extrarenal neoplasm
  - Ptosis
  - Trauma
  - Infection, especially long-standing
  - Aneurysm of renal artery (very rare)
  - Stress hypertrophy of pelvic and calyceal musculature

TABLE 4. *Hydronephrosis in infants and children. Nature and location in 828 cases*

	AUTOPSY (15,919)			CLINICAL			TOTAL
	316 cases			512 cases			828 cases
	Rt.	Lt.	Bil.	Rt.	Lt.	Bil.	
Ureteropelvic Junction and Adjacent Ureter							
Stricture	7	17	10*	33	32	11†	110
Aberrant Vessel	3	8		10	16		37
Stone		1			2		3
Valve (fold)			5				5
Kink‡			1	2	4	2	9
Peri-ureteral Fibrosis	1			2			3
Tuberculosis	3			4	2		9
Postoperative Stricture		1					1
Hydro. ½ redupl. Kidney				9	6		15
Localized Hydronephrosis				4	6		10
Other			4				

* U.V.J. Stric. 1 side; U.P.J. on other (2). U.P.J. & U.V.J. on same side (Rt. 5; Lt. 2). Nephroptosis; Bilateral Ureteral Gumma; Uterine Artery Compression; Perinephric Abscess; Inflammatory Parenchymal Edema Causing Compression (Rt. 1).

† Bilateral U.V.J. & U.P.J. (3).

‡ All but one due to distal obstruction.

channels, the central nervous system lesions in the young most frequently being the result of anomalies of vertebroneural fusion (spina bifida, meningocele, etc.).

PATHOLOGY

The renal architectural changes in hydronephrosis are indicated in table 7 (after Hinman); the urographic corollary is given in table 8. The nearer the ob-

TABLE 5. *Hydronephrosis in infants and children. Nature and location in 828 cases*

	AUTOPSY (15,919)			CLINICAL			TOTAL
	316 cases			512 cases			828 cases
	Rt.	Lt.	Bil.	Rt.	Lt.	Bil.	
Body of Ureter							
Stricture	9	12	14	29	20	5	89
Stone		1	1		4		6
Valves (fold)	1	1	1				3
Kink			2	2	1	2	7
Peri-ureteral Fibrosis				1			1
Diverticulum					1		1
Other*							4
Ureterovesical Junction							
Stricture	13	14	24	54	52	68	225
Ureterocele	1	6	1	26	17	4	55
Stone	3	1			1		5
Ectopic	2			10	9	2	23
Fibrotic Ureter	1						1
U. opens in Diverticulum	2			1			3
Aberrant Vessel				1			1
Kinks†				9	8	4	21
Tuberculosis				4	2	1	7
Hydro. ½ Redupl. Kidney				21	12	1	34
Prolapsed Ureter					1		1
Other‡							8
Unknown§							29

* Aberrant Vessel (Rt. & Lt. each 1); Tumor Mass (Rt. 1); Tuberculosis (Lt. 1).

† Secondary to Distal Obstruction.

‡ 1. Bladder stone in diverticulum into which ureter opens.
2. Metastasis from sarcoma of uterus.
3. Ectopic kidney.
4. Extra-ureteral compression by retroperitoneal glands, retroperitoneal abscess, vesical diverticulum (each 1).

§ Unrecognized or undetermined neuromuscular vesical disease or long-standing infection was probably etiologic.

struction is to the kidney, the more rapid and severe are these changes. With increasing intrarenal urinary back pressure, which is the sum of the renal secretory pressure and the hydrostatic gravitational element, the renal parenchyma is progressively compressed between the tense expanding intrapelvic hydraulic mass and the dense renal capsule. There is interference with the parenchymal blood supply and the resulting anoxemia causes grave trophic and other destruc-

tive changes in the cellular structure and these will be most severe in the tissues farthest from the main blood supply. Intratubular distention augments this injury. As the parenchymal damage progresses, glomeruli are altered, many be-

TABLE 6. *Hydronephrosis in infants and children. Nature and location in 828 cases*

	AUTOPSY (15,919)	CLINICAL			TOTAL
	316 cases	512 cases			828 cases
	Bil.	Rt.	Lt.	Bil.	
Bladder Outlet					
Contracture	3	2	2	20	27
Neurogenous	9	4	2	31	46
Valves (fold)	1			2	3
Hypertrophy of trigone	1				1
Sarcoma of bladder	1			1	2
Sarcoma of prostate	1			4	5
Exstrophy of bladder				3	3
Unknown (prob. neurog.)	8			5	13
Urethra					
Posterior					
Valves	6		2	22	30
Hyper. verumontanum	17			5	22
Atresia	1				1
Anterior					
Stricture	1			6	7
Imperforate	1				1
Stenosis of meatus			1	4	5
Phimosis	2				2

TABLE 7. *Progressive changes in hydronephrosis*

TYPE OF URETERAL OBSTRUCTION	TYPE OF PATHOLOGIC CHANGE PROGRESSIVELY PRODUCED	
	Primary	Secondary and Tertiary
1. Complete	Primary atrophy	Secondary atrophy with anuria, or Changes with infection
	Hydronephrotic atrophy	Atrophic pyelonephritis, infected hydronephrosis, pyonephrosis
2. Partial	Hydronephrotic atrophy	Secondary atrophy with anuria, or
3. Progressive (partial co complete)		Changes with infection
4. Temporary (relief after 1 or 2)	Hydronephrotic atrophy	Changes with infection
5. Intermittent (1 or 2, periodically)		Changes with infection or Hydronephrotic repair

come hyalinized or disappear, while dilatation and shortening of the tubules occur and often with eventual disappearance of many.

The location and nature of the factors concerned in the pathogenesis of hydronephrosis as observed both at autopsy and clinically in the 512 cases in this series are shown in tables 4 to 6. The degree of hydronephrosis observed in the

clinical cases and graded from 1 to 4 plus is shown in table 9 (compare with tables 7 and 8). The writer's clinically convenient rule-of-thumb gradation of hydronephrosis is as follows: 1 plus designates pelvicalyceal dilatation half again normal size; 2 plus means twice normal size; 3 plus signifies three times normal size, and 4 plus, four or more times normal size. It is recognized that this classification or grouping is conservative and subject to criticism for it is the functional rather than the anatomic damage we are fundamentally interested in and concerned about. When the pelvis is largely extrarenal and by dilatation more or less buffers the urinary back pressure, calyceal dilatation is usually comparably less than that of the pelvis, while in intrarenal pelvis, great parenchymal damage commonly results from anatomically moderate pelvicalyceal dilatation. In the usual postmortem examination and owing to some ureteropelvicalyceal contraction after death, only the more advanced grades of hydronephrosis are likely to be recognized in the gross specimen. These are chiefly the lesions that urographically one would rate 3 plus or 4 plus, while many of those which urographically would be designated as 2 plus degree will be passed over and practically no 1 plus hydronephroses will be recorded. For the same reason ureterocele

TABLE 8. *Urographic changes in hydronephrosis*

LOCATION	EARLY	LATER	ADVANCED*
Pelvis	Increase	Increase	Increase (round sac)
Major calyces	Broadening at base	Broadening throughout	Sacculation
Minor calyces	Flattening or clubbing	Obliterated	Obliterated
Papillae	Shortening	Shortening	Obliterated
Ureter	No change	Change in insertion angle	Elongated (usually not seen in urogram)

is commonly overlooked by the autopsy surgeon. Therefore, in the statistical study of the degree of hydronephrosis present in the cases upon which this communication is based, only those clinically studied are recorded.

The degree and nature of accompanying infection in the clinical cases are shown in table 9 as are associated renal anomalies and pathology. It is noteworthy that a wide variety of nonurologic maldevelopments were found in this series and no system was spared.

Hydronephrosis is of notoriously high incidence in renal reduplication and in these organs as in congenital ureteral obstruction the occurrence of clinical disease is approximately twenty times that found in normally formed kidneys (table 10). In renal reduplication, the superior pelvis is involved nearly twice as often as the lower pelvis, the ureter of the superior pelvis being correspondingly more likely to be strictured, to terminate in ureterocele or to be ectopic (table 10). In several of our cases of bilateral hydronephrosis, the obstructing lesion was at the ureteropelvic junction on one side and at the ureterovesical junction on the other, or at other and different levels on each side.

Other complicating pathologic conditions such as stone, ureteral kink and so

TABLE 9. *Hydronephrosis in infants and children. Pathology in 235 clinical cases*

	PELVIS											
	Single				Reduplicated							
					Right			Left			Both	
	Rt.	Lt.	Bil.	Total	Up.	Low.	Both	Up.	Low.	Both	Up.	Low.
Degree												
1 plus	27	16	9	52	1	3			3			1
2 plus	13	16	11	40		2		1	4			1
3 plus	8	13	7	28	3	2	1	3	1			1
4 plus	18	29	29	76	6		3	4	3	2		
Not record.	8	2	5	15	1					1		1
Infection												
Present	44	43	62	149	10	6		7	7	2		4
None	5	6	3	14	1				1	1	2	
Not record.	13	10	15	38	1			1				
Pyonephrosis												
Nontuberc.	1	4	2	7	5	1	1	4		1		
Hydro. Atrophy	3	8	5	16					1	1		
Kidney												
Solitary	2	1		3								
Hypoplastic	1			1								
Reduplicated	17	17	15	49								
Horseshoe			2	2								
Ectopic	1	1	1	3								
Malrotated	2			2								
Tumor		1		1*								

* Early Wilms'; resected left lower segment of redupl. left kidney.

TABLE 10. *Hydronephrosis in infants and children. Pathology: Pelvic reduplication in 235 clinical cases*

			Rt.	Lt.	Bil.
Kidney-Reduplicated		Ureter-Reduplicated			
Right	24	Involved Pelvis			
Left	21	Stricture			
Bilateral	20	U.P.J.	1	1	
Involved Pelvis		Body	1	2	
Upper	29	U.V.J.	14	7	3
Lower	21	Ureterocele	11	6	1
Both	14	Ectopic			
Ureter-Reduplicated		Dil. Orifice	3	6	
Complete		Str. Orifice	3		
Unilateral	33	Kink	3	1	
Bilateral	10	Vascular Obstr.	2		
Incomplete		Tortuous	2	2	
Unilateral	9				
Bilateral	1				

forth are shown in tables 4, 5 and 6. The urinary stasis favors calculous formation and chiefly in the renal pelvis.

SYMPTOMS

Hydronephrosis produces no characteristic syndrome of its own (table 11). A palpable hydronephrotic mass in the upper lateral abdomen may be the only manifestation and in some cases has even been discovered by the child. In hydronephrosis the clinical syndrome inadequately designated as chronic pyelitis commonly exists as it did in two-thirds (64.7 per cent) of the 235 recent cases of this series urologically studied. Persistent or recurrent pyuria, chills, fever, pain in the affected side and often with periodic hematuria are the most frequent manifestations. With exacerbation of smoldering infection in the hydronephrotic kidney, the diagnosis of persistent acute pyelitis is commonly made and the condition demands immediate urologic examination.

With secondary vesical involvement by infection or when there is obstruction at or peripheral to the bladder outlet, disturbances of urination with frequency, urgency, nocturia, dysuria, dribbling, incontinence and even "enuresis" often

TABLE 11. *Hydronephrosis in infants and children. Symptoms in 235 clinical cases*

Pyuria	149	Chronic Uremia	6
Fever	93	Nervous Manifestations	
Pain	60	Convulsions	9
Hematuria	30	Headaches	3
Mass	15	Marasmic	4
Gastro-intestinal		Stuporous	2
Nausea	9	Toxic	9
Vomiting	43	Sepsis	1
Anorexia	5	Retention	
Loss of Weight	1	Acute	5
Failure to Gain	3	Chronic	23
Diarrhea	8	Frequency	38
Constipation	12	Dribbling	22
Edema—each	1	Dysuria	21
Eyes, head, scrotum		Enuresis	16
		Prolapsed Ureterocele	3

exist. In some instances the incontinence results from ectopic ureteral opening above which there is hydronephrosis. Gastro-intestinal disturbances are outstanding symptoms in half of all cases of hydronephrosis in the young and may result from compression of the bowel by the renal mass, or reflect toxemia consequent to urinary infection and/or renal functional damage. Loss of appetite, anorexia, nausea, vomiting, failure to grow, loss of weight and strength are the usual symptoms. As the hydronephrosis becomes large, the bowel is compressed; in a three-year-old boy with massive left hydronephrosis, the descending colon was pushed across the abdomen to course parallel and adjacent to the ascending colon. Constipation was a dominant symptom. Neurologic manifestations such as drowsiness, lethargy, hyperirritability, nervousness are frequent in these cases and reflect the irritation of the central nervous system by the urinary toxemia. The symptoms in the clinical cases are shown in table 11.

DIAGNOSIS

The history of chronic pyuria should at once suggest the presence of hydronephrosis. As a corollary, pyuria exists in 60 to 95 per cent of hydronephroses and albuminuria in half to three-fourths. The diagnosis will be confirmed only by adequate, and usually complete, urologic examination, the indications for which are given in table 12, and when these manifestations are present, hydronephrosis is commonly found. A tenth to a fourth of hydronephroses in children are palpable (table 13). Yet the diagnosis of hydronephrosis by palpation alone is extremely hazardous in view of the high incidence of renal, adrenal and cystic tumors which upon physical examination alone may suggest tense hydronephrosis. Renal tuberculosis, calculous pyonephrosis, perinephritis, acute or chronic pyelonephritis are also to be considered in the differential diagnosis.

In the diagnostic survey excretory urography commonly suggests that hydronephrosis exists and may identify complicating calculous disease or diverticula, for example. Although today we almost always make a preliminary or "scout"

TABLE 12. *Indications for urologic examination in infants and children*

1. Pyuria
   a. acute persistent
   b. chronic
2. Disturbances of urination—dysuria, frequency, urgency and so forth
3. Hematuria (except acute nephritis)
4. Abdominal pain
5. Abdominal tumor
6. Anomaly of the external genitalia
7. Urogenital injury
8. Spinal cord injury and disease
9. Enuresis
10. Renal insufficiency
11. Retarded growth
12. Hypertensive vascular disease

excretory urographic study, definitive pyelographic delineation requires retrograde pyelography and preferably bilateral to demonstrate the morphologic and functional integrity of the opposite kidney as well. Moreover, in hydronephrosis and as shown in tables 9 and 10, the hydronephrotic organ is often anomalous, being reduplicated, horseshoe, ectopic or cystic, or even tumor bearing.

By complete examination, reduplicated kidneys or other conditions of surgical import are commonly disclosed even though not always suggested by the excretory study. Moreover, at operation a clear cut ureteropyelogram is of great comfort and guidance for the surgeon, particularly when renal resection is required. Because of the unreliability and inadequacy of excretory urographic studies for the demonstration of upper urinary tract surgical disease in over half of all cases in infants and children, and because of some unfortunate experiences resulting from reliance on this urographic demonstration alone, retrograde pyelography is routinely performed preoperative by the writer.

The laboratory evidence merits serious consideration not only in formulating

the therapeutic program but the prognosis as well (table 13). In the treatment of hydronephrosis this is of prime consideration when the problem of preliminary drainage (nephrostomy, cystostomy and so forth) arises because of the gravity of the patient's condition or conservation of the kidney is demanded. The laboratory studies should include not only careful urinalysis of aseptically collected specimens (by catheterization in females of all ages) but the bacteriology of the urine. Tests of renal function are made, notably phenolsulfonphthalein intravenous excretion, as well as the blood chemistry estimations as they may disclose nitrogenous retention, the carbon dioxide combining power and, in cases of long-standing renal damage, the blood chloride, serum phosphorus and calcium, with a view to recognition of possible primary or secondary renal hyperparathyroidism.

TABLE 13. *Hydronephrosis in infants and children. Diagnosis in 235 clinical cases*

Palpation-Palpable Mass	20	Urinalysis	
Cystography	33	Normal	14
Pyelography		Albumin	118
Excretory	108	Pyuria	156
Retrograde	223	Blood	71
Urethrography	5	Bacteria (culture)	
Prev. Urologic Exam. and/or Treatment	101	Gram-positive cocci	
		Streptococci	53
Rectal Paralysis	14	Staphylococci	106
		Gram-negative bacilli	
		"B. coli"	106
		Ps. aerugenosa	10
		Tuberculosis	1
		Mixed	85
		Sterile	18

PROGNOSIS

This depends upon 1) the degree of renal damage including that due to the ravages of infection, and 2) the adequacy of treatment. Unfortunately there is bilateral involvement in at least a third of the clinically recognized cases. In a third to a half of all cases of unilateral hydronephrosis, adequate treatment will demand nephrectomy because the condition has progressed unidentified and the renal injury is irreversible and/or irreparable. Here the renal damage and the required nephrectomy may be looked upon as the fruits of medical neglect. In children with unilateral hydronephrosis and a sound kidney on the other side, the surgical mortality is negligible and few will be dead within 10 years. In children with well-developed bilateral hydronephrosis and without treatment two-thirds will be dead within ten years. In most cases death will result from renal failure with complicating urinary sepsis but terminal pneumonia in these debilitated patients is of high incidence. Yet in several of our patients first seen in infancy with advanced bilateral hydronephrosis and whose outlook at the time seemed hopeless, multiple stage conservative surgical therapy has amazingly restored them to apparent good health, albeit with the scars of irreversible

TABLE 14. *Hydronephrosis in infants and children. Treatment in 512 cases*

None or refused	49	Surgery	
Chemotherapy		Kidney	
Only	8	Nephrectomy	40
And as follows:	251	Nephro-ureterectomy	31
Dilation		Ureteroheminephrectomy	25
Ureter	140	Horseshoe	
Bladder neck	17	Resection	3
Urethra		Symphysiotomy	3
Body	3	Nephrostomy	
Meatus (many)		Temporary	
Indwelling catheter	84	Unilateral	16
Temporary	77	Bilateral	16
Ureter	18	Permanent	
Corset for nephroptosis	1	Unilateral	14
		Bilateral	4
		Pyelostomy	1
		Pyelotomy	1
		Pelvic Resection	6
		Nephropexy*	5

* In connection with other renal surgery.

TABLE 14A. *Hydronephrosis in infants and children. Treatment in 512 cases*

URETER	UNILAT.	BILAT.
Ureterostomy	4	3
Cutaneous (permanent)	1	2
Lithotomy	3	
Ureterolysis	2	
Ureteroplasty		
U.P.J.		
Resection	5	
Y-plasty	11	1
Body		
Incision	3	
Resection	5	2
U.V.J.		
Incision		
(Meatotomy)		
Cystoscopic	11	5
Transvesical	7	6
Ureteromeatoplasty	5	6
Ureteroneocystostomy	5	1
Aberrant Vessel Resection	12	
Ureterocelectomy		
Suprapubic	11	
Transurethral	10	
Excision prolapsed	1	
Ureterosigmoidostomy		2

damage in their kidneys. Some of these are now in college. Here, as in the treatment of neoplastic disease, only by treating the many, do we cure the few. In a

third of the cases in the autopsy series, death was directly attributable to the hydronephrosis and its complicating infection, renal failure and urinary toxemia.

TABLE 14B. *Hydronephrosis in infants and children. Treatment in 512 cases*

Bladder		Urethra	
Cystostomy		Valve Resection	11
Temporary	38	Urethrotomy	
Permanent	18	Internal	2
Diverticulectomy	3	External	1
With ureterocelectomy	2	Meatotomy	
Cystolithotomy	2	(many)	
Litholapaxy	1	Only	5
Bladder neck resection			
Suprapubic		Cystoprostatectomy	2
V-wedge	9	(sarcoma prostate)	
Trigonal curtain	1		
Transurethral		Incision Imperforate	
Punch	6	Hymen (hydrocolpos)	2
Resectoscopic	22		

TABLE 15. *Hydronephrosis in infants and children. Results in 512 clinical cases*

	NONOPERATIVE	SURGICAL	TOTAL
Cured*	14	70	84
Improved			
With urine sterile	19	22	41
Without urine sterile	17	33	50
Urine culture unknown			78
Unimproved			
Stasis persists	10	27	37
Died			
Before Treatment	6		6
Postoperative		13	13
Urinary sepsis	4	9	13
Uremia	5	7	12
Urologic disease			25
Other causes			19
Lost or result unknown			129
No treatment or refused			49

* Both infection and stasis.

TREATMENT

This will be based upon the pathologic anatomy as urographically delineated and in correlation with which the renal function, particularly of the remaining kidney, as well as the general condition of the patient must be evaluated. In several infants intensely ill with advanced bilateral infected hydronephrosis, initial bilateral nephrostomy for periods up to six months has been used. In the rare instance this must be permanent.

Unfortunately nephrectomy in some form is demanded in at least a third of these cases coming to operation. In some children conservative plastic operation

will succeed in saving the kidney; the prospects of this favorable outcome are vastly increased by simultaneous intensive chemotherapy and/or antibiotic therapy.

The technical procedures employed in the treatment of hydronephrosis and according to surgical and clinical indications are shown in table 14 in which their application in the clinical series here reported is enumerated.

Results of treatment. The results of therapy in these cases are shown in table 15. Attention is directed to the desirability of precision in classifying the therapeutic results. A child symptomatically relieved by nephrectomy yet in whom urinary infection or a stasis-producing condition persists, is not cured. In hydronephrosis a patient is cured only when urinary stasis has been eradicated, the urine is sterilized, and renal function adequate to support life for a reasonable number of years has been achieved. Yet many patients with long-standing renal lesions in which irreversible damage has occurred or a condition such as irremediable neuromuscular vesical disease exists, can never be cured in the strict sense.

SUMMARY

Hydronephrosis is the commonest abdominal tumor of childhood at which age it most often results from congenital causes. Rarely the obstruction is acquired as in urinary calculous disease or spinal injury. The pathologic changes are fundamentally those of renal destruction and are anatomically characterized by pelvicalyceal dilatation, parenchymal thinning, sclerosis and destruction of secretory elements. The commonest clinical manifestation is persistent pyuria, too often designated as chronic pyelitis, both inadequately investigated and treated. Less frequently the appearance of a mass or pain in the loin or abdomen directs attention to the lesion. Acute exacerbation of smoldering infection associated with infected hydronephrosis generally causes the diagnosis of persistent acute pyelitis to be made. The indications for complete urologic examination of children with hydronephrosis are many but pyuria, persistent or acute, pain or a mass in the loin or abdomen, hematuria and reflex vesical disturbances are the usual symptoms. The diagnosis is readily suggested by excretory urographic study and can be made absolute by satisfactory retrograde pyelography and preferably bilateral. Treatment is according to the specific surgical indication and occasionally conservative therapy by instrumental dilation is successful. In most cases operation is necessary although it may often be conservative surgery. Yet in a third to a half of the children in whom hydronephrosis is clinically recognized, the severity of the renal damage warrants only total nephrectomy. With early identification and proper treatment, the majority of these kidneys should be saved as well as many lives.

140 E. 54th St., New York, N. Y.

THE EFFECTS OF INTRARENAL HYDRONEPHROSIS ON THE COMPONENTS OF THE RENAL CORTEX

CLYDE L. DEMING

From Department of Surgery, Section on Urology, Yale University School of Medicine, and Grace-New Haven Community Hospital, New Haven, Conn.

This paper deals with the histopathology and hydrodynamics of the various components of the kidney in the development of intrarenal hydronephrosis, excluding the factor of infection. Grossly, the whole kidney becomes enlarged and its surface lobulated due to the dilatation of the individual calyces. As the hydronephrosis reaches the final state of complete atrophy of the kidney the whole organ appears as a thin-walled sac. Rupture of these thin-walled sacs is relatively rare but does occur.

Our interest particularly is focused upon the pathology and physiology of the calyces, the vascular system and the various tubules that comprise the cortex and medulla of the kidney. Studies of the interior of the pelvis by Hinman, Strong, Oliver and Ponfick in experimental hydronephrosis would indicate that as the pelvis becomes distended a certain order of pathological events takes place. The papillae are torn apart causing an irregular oval depression from whose margin radiate interrupted collecting tubules. In time these interrupted tubules become closed with connective tissue and their openings covered with epithelium. As the pelvis increases in size the cortex becomes thinner due to the atrophy of the various tubular structures. Ponfick states that the rate of accumulation of the pelvic fluid and the rate of atrophy of the parenchyma are in agreement.

VASCULAR CHANGES

As the pelvis becomes distended one or all of the calyces become broader, affecting both the radial and circumferential vessels. The former will be foreshortened and crinkled, while the latter will be lengthened, and the total blood flow will thus be reduced through both arterial systems. Those portions of the kidney supplied by the most distal vessels will atrophy first. Hinman has well demonstrated this pathological change and concludes that the loss of nutrition plays a large part in the development of renal peripheral atrophy and the subsequent development of hydronephrosis. Trueta substantiates these vascular changes in his description of the greater and lesser circulation of the kidney, the greater circulation being through the medulla and the lesser through the cortical portion of the kidney.

THE GLOMERULI

The juxtamedullary glomeruli and associated medullary vascular channels offer a pathway of lesser resistance for circulation than through the superficial glomeruli in the cortex. Furthermore, the interlobular veins and cortical intertubular capillaries are filled by reflux from the vessels draining the medulla. The cortical glomerulus has an efferent vessel which is small in caliber and which breaks up to form the cortical interlobular capillary network; while the juxta-

medullary glomerulus has an efferent vessel which is large and passes into the medulla to divide into the vasa recta. The juxtamedullary glomeruli and vasa recta form a by-pass through the medulla. This "by-passing" of the blood causes anemia, ischemia and atrophy, and as the hydronephrosis increases in size the cortical portion of the kidney is the first to atrophy.

The first changes within the glomerulus are the widening of Bowman's space and shrinking of the capillary tuft due to loss of blood supply. A cleft often appears within the tuft. Later in the pathological process Bowman's membrane becomes puckered, connective tissue proliferation appears and finally a hyalinization within the tuft. The glomeruli may in neighboring areas show cystic changes and vary in size and shape due to the pressure in the pelvis and contracture of the connective tissue in the cortex.

TUBULAR CHANGES

The tubular changes are closely related to those of the pelvis and the vascular tissues, and nephrons or groups of nephrons are affected. The tubules degenerate in groups mainly from anemia, because several tubules have a common blood supply. What effect the free capillary anastomosis of the tubular bed has is not known. Group distribution of hydronephrotic change is a definite characteristic and is related to vascular change. The immediate effect of back pressure is venous congestion not unlike an inflammatory reaction with tubular dilatation. Irregular changes in the intrapelvic pressure such as are seen in intermittent hydronephrosis will cause irregular circulation and irregular changes in the tubules, a collapse and atrophy in some while in the freer areas of circulation an increased functional activity and even a compensatory hypertrophy of the tubules may occur. As the hydronephrosis progresses these tubules are deprived of their blood supply and degenerate in groups. Usually the convoluted portions degenerate first, then the looped portions and the medullary glomeruli are the last to resist. Group resistance and group atrophy are characteristics of hydronephrosis, hence the saccular areas which are seen grossly on exposure of an hydronephrotic kidney.

A detailed study of the various tubules by Oliver and Strong throws much light on the progressive pathology of the tubular elements of the nephron. The first changes occur in the proximal convoluted tubules. Their lumina show increase in caliber, and their epithelial cells become flattened. Some of these tubules may be compressed with resulting degeneration of their epithelial cells and vacuolization of their cytoplasm, followed by progressive atrophy and proliferative connective tissue formation. The proximal convoluted tubules form the chief bulk of the organ, hence their rapid atrophy is a factor of greatest importance in facilitating the accumulation of pelvic fluid and determining the architecture of the hydronephrotic kidney. The loops of Henle at first are sharply distinguished from the proximal convoluted tubules, for they remain small and thin-walled and never increase in size or become dilated. In the latter stages they may be represented by strands of tissue and be confused with connective tissue. The collecting tubules at first increase in size irregularly in the medulla

and cortex, later become fragmented, and end blindly at the pelvis with a saccular deformity. Cortical tubules become interrupted and persist as blind structures varying in size and form and not infrequently as a linear series of minute spherical cysts surrounded by connective tissue. The cortical portion of the kidney first shows evidence of change in the collecting tubules, later the medullary portion, and finally the tubules adjacent to the pelvis are affected. For a time the fluid flows through these short, dilated, central collecting tubules to be absorbed by the distal convoluted tubules. Blood in the urine in hydronephrosis may come from the distal convoluted tubules. Backflow is impossible in the interrupted convoluted tubules in the lateral area, while it occurs in some of the nephrons in the intermediate area, and there may be a flow directly towards the pelvis. The interstitial tissue stroma at first is edematous, but later infiltration of polymorphonuclear leukocytes and round cells occurs. Scars appear about the larger vessels. Early structural changes in the blood vessels appear insignificant, although early congestion of the capillaries and veins occurs. Compression of the glomerular capillaries is followed by hyalinization of the smaller arterial branches and connective tissue proliferation within the capillary tuft. The development of fibrosis of the interstitial tissue causes retraction and tortuosity of the tubules, but the resistance to molding and loss of continuity is evidenced by an amazing restitution of physiological activity when the blood flow is returned after removal of the obstructing factor. This reversible phenomenon of physiology is exemplified in the successfully operated hydronephrotic kidneys.

RATE OF HYDRONEPHROTIC DEVELOPMENT

The size of the pelvis does not necessarily represent the amount of atrophy present in the kidney. Many large extrarenal hydronephroses occur in kidneys with exceptionally well-preserved functions, while a moderate-sized hydronephrotic kidney may show much atrophy of the cortex. Clinically we encounter relatively large hydronephrotic sacs in children and in middle-aged patients who have but few symptoms. Other patients have symptoms compatible with a diagnosis of hydronephrosis for many years without a greatly distended pelvis. Occasionally in cases with ureteral calculi we obtain excretory urograms which show the gradual development of a certain amount of dilatation of the ureter and pelvis with blunting of the calyces and thinning of the cortex of the kidney. Rarely do we have an opportunity to observe clinically and to correlate the rate of hydronephrotic development with the factors which are responsible for the progressive pathological lesion.

The first factor which is essential for hydronephrotic atrophy is back pressure. Experimenting with dogs, Cushny and Barney have demonstrated that if the ureter be ligated and the intrapelvic pressure be recorded the secretory force of the kidney will raise the mercury in the manometer from 50 to 70 mm., but after several hours it will gradually drop. The administration of diuretics produces little influence on the intrapelvic pressure and then only temporary. Any change in blood pressure or degree of obstruction, activity or position of the patient would influence the intrapelvic pressure. Hinman could not demonstrate any

influence of hydration and dehydration on the rate of hydronephrotic development. Even though a splanchnicotomy causes an intrarenal vasodilatation and an increase in the renal blood flow with a prolonged diuresis there is no modification in the rate of hydronephrotic atrophy. Neither diuresis nor oliguria is effective in the developing hydronephrotic kidney.

Hinman, experimenting with a series of rabbits, ligated the ureter, partially ligated the renal vein, the renal artery and lastly performed decapsulation. In the absence of collateral circulation he found that all of these factors hastened hydronephrotic atrophy because of the lack of nutrition to the glomeruli and tubules. Hence we may expect that any distention of the renal pelvis which causes pressure on the renal vein and artery would satisfy conditions favorable for a relatively rapidly-developing hydronephrotic atrophy, provided that the pressure was constant and progressive. Secretion of some urine must continue with back pressure; but if the secretion ceases blood flow stops and primary atrophy follows. Clinically, infection occasionally supervenes, produces an anuria and blots out the hydrodynamic hydronephrotic factor, so that the patient either succumbs to the infection or the kidney is transformed into an insignificant mass of fibrous tissue. The rate of hydronephrotic development depends on the degree of urinary obstruction, renal blood flow, fluid absorption from the pelvis and atrophy of the nephrons.

ABSORPTION AND BACK FLOW

Back pressure, curtailment of the blood flow and diuresis do not embrace all the mechanical hydrodynamic factors at play in the production of hydronephrosis. There must be a continuous secretion of urine. Since it can not all escape through the ureter it must either be absorbed or escape through some mechanism of backflow into the circulation. The excreto-secretory units will continue to function as long as the intrapelvic pressure remains lower than the secretory pressure, for when they become equal secretion of urine ceases. The relationship of these two forces must always exist in this order, otherwise the pelvis of the kidney would not enlarge with fluid. As the hydronephrosis progresses the secretory function of the kidney diminishes. Complete atrophy does not come into being until long after the function is lost. As long as a hydronephrosis exists there must be some exchange of fluid within the pelvis. The fluid of an early hydronephrosis contains practically all the contents of a normal urine with urea, salt, etc.; but in the late stages of development there is less urea, some sugar, and finally only salt and water. It can not well be compared to a fresh-water pond with an inlet and outlet of running water, because the fluid in the pelvis changes its character in the progression of the hydronephrosis This change in the fluid content of the pelvis is brought about by tubular reabsorption until the tubules are destroyed. Loeb has shown that alkaline solutions promote permeability of the semi-permeable membrane of the pelvis, while acid urine prevented this permeable action. Hence patients with an acid urine would have an accelerated rate of hydronephrotic development.

Hinman's experimental pyelovenous backflow and direct connection with lymphatic channels offers another avenue for the escape of fluid from the renal

pelvis. The extensive observations of Olsson support the contentions of Hinman. Wood first demonstrated the lymphatic connection of the pelvis in a case of chyluria on whom he had performed a retrograde pyelogram. Since then, numerous clinicians, including the author, have made such observations. The pyelogram in these patients depicts a linear shadow extending from the pelvis of the kidney toward the median aspect of the patient. In contrast, tubular backflow presents a bursting tuft effect at the calyx in the pyelograms. Richards observed a mercury droplet in the frog's kidney to flow from the tubules into the vein so that tubulovenous backflow is possible in the frog, although he did not demonstrate the exact point of communication. In the normal papilla there is a proliferative type of epithelium around the mouths of the ducts so that as the hydronephrosis develops it produces a radial distention of the papillary area and causes the mouths of the ducts to open, allowing a free communication between the pelvis and the tubules. If the ureteral obstruction be relieved the kidney will secrete the fluid with the same contents as is found within the hydronephrotic pelvis which means a total absorption of the pelvic contents.

Olsson believes that both pyelovenous backflow and pyelolymphatic backflow occur, but that they are not common. He prefers to explain the hydromechanics of the backflow as a sinal extravasate. This hydromechanical condition is brought about by the rupture of the epithelial lining of a tubule with extravasation along the interlobular vessels. Oliver has demonstrated that the distal convoluted tubules in hydronephrosis are subject to much diverticular formation. May not some of these diverticula of the convoluted tubules rupture under back pressure, thus causing the sinus extravasation of Olsson?

It is quite evident, then, that the hydromechanics of the developing hydronephrosis involve the factors of obstruction, of renal secretion, tubular absorption, pyelovenous backflow, pyelolymphatic backflow and interstitial backflow and that these factors are in constant effect until renal secretion ceases and the hydronephrotic atrophic state is complete.

SUMMARY

The first factor in the development of hydronephrosis is back pressure. With the distention of the pelvis and calyces the blood flow through the radial and circumferential arteries is reduced so that the earliest vascular change occurs in the lesser circulation, exemplified by the atrophy of the cortical glomeruli. The last glomeruli to be affected are those in the medulla. Tubular changes are closely related to the vascular changes. Groups of nephrons are involved in the pathological changes. The first tubular change occurs in the convoluted tubules whose lumina become increased in caliber and whose epithelium becomes flattened and later atrophies. The loops of Henle remain at first small and thin-walled, never dilated, but finally atrophy to become only strands of connective tissue. The collecting tubules increase in size irregularly in the cortex and medulla, become fragmented and interrupted and end blindly as a saccular deformity. Fibrosis of the interstitial connective tissue modifies the configuration of the tubules.

The hydrodynamics of hydronephrosis depends on ureteral or ureteropelvic

obstruction and renal secretion, for neither diuresis, hydration or dehydration, or splanchnicotomy affect the rate of development. There must always be some urinary secretion, although as the hydronephrosis develops the kidney function diminishes. Evidence is shown that the fluid of the pelvis escapes through several avenues: 1) if alkaline, through the semipermeable membrane of the pelvis; 2) by tubular backflow through the calyx; 3) by pyelovenous backflow; 4) by pyelolymphatic backflow; and 5) by "sinus extravasate" into the tissue about the hilum of the kidney; and that these factors, together with obstruction and urinary secretion, are in constant effect until the hydronephrotic atrophic state is complete.

CONCLUSION

Two facts are self evident:

a) From the study of the pyelograms, pathology and histodynamics of the renal components, one can ascertain how much permanent damage has taken place in the nephrons in hydronephrosis.

b) One can avoid the embarrassment of a secondary nephrectomy by doing a primary nephrectomy instead of a plastic repair which will later necessitate a nephrectomy.

789 Howard Ave., New Haven 4, Conn.

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DISCUSSION

Dr. George G. Smith (Brookline, Mass.): These have been very interesting and worthwhile presentations. It seems rather an anticlimax to present three small, minor observations in the face of such an accumulation of evidence; nevertheless, I would like to do it.

I have had several patients on whom I have done a nephrectomy for hydronephrosis, who had, at the time of the nephrectomy, a normal pyelogram on the opposite side; yet, within 4 or 5 years, a hydronephrosis developed in the remaining kidney. Whether it is due to the throwing of more work on that kidney or would have happened anyway, I don't know.

(Slide) There are two points in technique which I would like to mention. This is a rather poor pyelogram, and the reason why I show it is because it shows a case 5 years after intubation. The patient, a man of 55 when we operated upon him, had three small stones in the left kidney. He had a marked hydronephrosis and a dilated ureter down to a point 3 inches below the pelvis, where, on operation, there proved to be a sharp kink. The ureter, for about 3 or 4 cm., was definitely narrowed. It was far enough below the pelvis so that one could not do a plastic, so I followed the advice given us by Drs. Keyes and David M. Davis and split the ureter, put in a 10F tube, and drew the cut edges of the ureter together over the tube in two places. The tube was in about three weeks. The patient did very well and has been very well since then, except for the removal of a gall stone.

The excretory urogram taken 5 years after operation shows a ureter which is displaced outward, but the pelvis and upper ureter are not dilated.

Dr. George Livermore (Memphis, Tenn.): I have nothing to add to the discussion, but I want to report a case and ask for help. This patient is a woman of 40 years of age who came in with a symptomless mass in her left side, under the ribs, which had been present for 3 years. It was symptomless, no pain, no urinary difficulty. The only thing she had noticed was the mass.

I ruled out a malignancy on account of the length of time with no manifestations of any type, but the pyelogram showed the condition to be one of those typical kidney tumor pictures of the C-shaped kidney pelvis, which made me suspicious of an intrarenal tumor of nonmalignant type.

Here are the pictures—and, by the way, at operation, it was found to be a hydronephrotic kidney which we had noted in the pyelogram. But, of course, we could not eliminate tumor on account of the pyelogram.

At the time of operation, the kidney was imbedded in a mass of perirenal fat, as usual, and when that mass had been removed with the kidney, the mass of fat was stripped off and was found to be polycystic in character. There was no evidence of any kidney tissue in the fatty mass, and yet it has all the appearance of a polycystic kidney.

Now, what I want help on is whether this cystic mass is the remains of the wolffian duct or other embryological kidney tissue and whether it was a supernumerated kidney which had undergone cystic degeneration.

(Slide) This is the picture of the kidney on the left, surrounded by the mass of fat. Here is the fat which was stripped off.

(Slide) This is the kidney itself, from the other side, which, you see, shows a fairly normal kidney.

(Slide) This is the mass of fat which was cut in half, which shows the polycystic condition.

If you can help me, I would be obliged.

DR. WILLIAM F. BRAASCH (Rochester, Minn.): There are several features of the problem of pyelectasis which have been of particular interest to me over the years.

In the first place, I should like to consider a matter of semantics namely the term "hydronephrosis." We tried to get away from this word for many years and failed. The term hydronephrosis applied to the obstructed renal pelvis is certainly a misnomer in every way. Usage apparently has controlled the situation. Attempts have been made repeatedly to change it but without success. How much better is the term "pyelectasis," and "pyelo-ureterectasis" to describe the lesion if the ureter also is obstructed. Pyelo-ureterectasis is present so often and not pyelectasis alone. This, of course, makes an entirely different clinical problem from simple pyelectasis.

Another subject of interest is the comparative value of excretory urography and retrograde urography. As Dr. Campbell stated, excretory urography in children is very apt to be indefinite and may be very difficult to interpret. The excretory urogram does not visualize the ureteral outline well in many cases, and may fail to show obstruction when present in the lower ureter. In such cases retrograde urography may be necessary and will visualize pyelectasis and pyelo-ureterectasis very much better.

Another point which I wish to emphasize is the frequency with which pyelectasis is found in both kidneys. In fact, bilateral pyelectasis is found in at least 50 per cent of cases. Although the degree of pyelectasis may be the same in both kidneys, more often it is more advanced in one. It is a curious thing how pyelectasis in one kidney will become progressive while that in the other remains stationary. So often with bilateral pyelectasis, after a plastic operation is done on one kidney and renal drainage is restored, where the patient is examined 10 or 15 years later, the same degree of pyelectasis remains in the unoperated kidney as existed at the time of the first examination. In fact, with bilateral pyelectasis one side may remain stationary in a high percentage of cases.

Patients with bilateral pyelectasis however should be warned to return at stated intervals for re-examination in order to look for evidence of progressive pyelectasis in the unoperated kidney.

Another interesting subject is that of bilateral stricture. Now, stricture of the ureter with an inflammatory etiology is observed comparatively rarely as a cause of obstruction in the upper portion of the ureter. In those few cases that Dr. Campbell cited as strictures, no evidence of inflammation was present except as a secondary complication. Ureteral constriction when observed usually is a congenital narrowing, or the result of external compression, and should not be termed stricture.

DR. DAVID M. DAVIS (Philadelphia, Pa.): I wish to confine my remarks to one or two words about the operation referred to as intubated ureterotomy in the treatment of the narrowings which cause hydronephrosis.

As our thoughts have developed about this operation, we have come more and more to the concept that the important element in what one does is the splint tube, and therefore we are trying to find out what the tissues of the ureter and pelvis will do when they are left in the proximity of the splint tube for a suitable length of time. If we know that, we will then know best how to arrange them about the splint tube and how much careful plastic cutting and suturing are necessary. It seems to me that some of it may be necessary in some cases, and in others it may be omitted with a saving of time and trouble and giving a desirable freedom of foreign body in the operative wound.

We have found, and we still find, it a very useful procedure applied in various ways, according to the circumstances existing. It is useful in people of all ages. I would like to show some pictures of a little girl, 18 months of age, who illustrates many of the points that Dr. Campbell brought up and Dr. Braasch has emphasized.

(Slide) This little girl was perfectly healthy, but her pediatrician found a large mass in the right upper quadrant, and therefore an excretory urogram was made. This shows a huge right hydronephrosis and a fairly good-sized left hydronephrosis. The urine was sterile, and there had never been any attack of pyelonephritis. However, we felt that the pathological changes here were such that it would be unwise to let the little girl go, so we attempted to pass a catheter up the left ureter, and found great difficulty. Finally, a No. 4 went up. The urethral meatus was very small.

This pyelogram shows the hydronephrosis, a marked narrowing at the ureteropelvic junction, and, of course, this marked narrowing which we had observed cystoscopically in the lower ureter. It was felt necessary, from the distance between these two narrowings, to operate upon them separately. The first operation was an incision and intubation of the upper ureteropelvic stricture, and this is the intubating tube. It was a small child. I think that is about a No. 12. The pelvis was suitably drained. That tube was left in place for 4 weeks.

(Slide) At the end of 4 weeks, another operation was performed. The bladder was opened, and the ureteral meatus and lower ureter were incised, and again intubated with a No. 12 tube, which was attached to a small tube coming in through the pyelotomy incision. This, again, was left in place for 4 weeks, and this is a picture taken just before the tube was withdrawn.

The tube extends down into the bladder and out through the cystotomy wound. This picture was taken by injecting through the small tube, immediately after the withdrawal of the intubating tube or splint. The lower ureter now has an excellent contour.

This was taken after pulling the tube up a little higher, to show the contour of the entire ureter at this time. The cystotomy healed promptly, and the little girl has remained well since.

(Slide) This was taken about 4 months after operation, and at that time it was possible to introduce a No. 20 panendoscope into the bladder and a No. 10

bulb catheter ascended into the kidney pelvis with perfect ease. This is the pyelogram 4 months after the operation. We left the right kidney strictly alone, and fortunately it has not given any trouble to date, it being more important to restore the left kidney as much as possible.

The other case that I would like to show is that of a woman with hydronephrosis, infected, and with 3 stones in the kidney.

(Slide) Here are the stones. This is the retrograde pyelogram, showing a marked stenosis of the ureteropelvic junction. This is a picture taken 10 minutes after the ureteral catheter was withdrawn, the patient being in the upright position in the meantime.

We feel that these emptying pictures are extremely important in evaluating small and early hydronephrosis, and, after all, those are the ones that often give severe symptoms and in which the kidney can be definitely saved and restored to normal. This shows a very poor emptying at the end of 10 minutes.

(Slide) This is simply an excretory urogram, showing the hydronephrosis and stone. At operation, this marked narrowing was incised and intubated with a tube which extended through the entire length of the ureter and came out through the urethra. The stones were removed. They were in the calyces, so two nephrotomy incisions were necessary, and one of these nephrotomy incisions was used to bring out the splint tube, so we had both ends of it outside the body.

This was taken immediately after withdrawing the tube, and I think the ureteral outline is now excellent. The tube was left with its end in the pelvis, and, immediately after taking this picture, a clamp was put on this tube, then the patient stood upright for 10 minutes, and this picture was taken, showing that now the pelvis empties completely in 10 minutes.

It is a useful procedure. It can be modified and employed in many ways to help the urologist.

Dr. Austin I. Dodson (Richmond, Va.): About 6 months ago, I met a problem which I thought was rather interesting.

A boy 12 years of age had a fairly good-sized hydronephrosis on the left side, which had caused persistent pain for some time; the pyelogram showed dilatation of the right renal pelvis. At operation, we found a large pelvis with a rather long and flabby kidney, with blood vessels coming off and running across the front of the ureteropelvic area. The blood vessels were of such size that I felt we should not ligate them, so the pelvis was divided just above the ureteropelvic area, and the ureter brought in front of these blood vessels. When we replaced the kidney, it appeared that we had not remedied the condition very much. It seemed highly probable that the blood vessels might still cause some obstruction.

Remembering a case report that I had seen in the English literature, I folded the kidney back and sutured the lower pole to the back of the kidney near the upper pole, making a sort of caked kidney. That procedure carried the blood vessels well away from the pelvis.

An excretory urogram done recently showed a rather bizarre appearance, but an excellently functioning and perfectly draining kidney.

Some of you may have done this, but if not, it may be a useful procedure in the occasional case.

DR. EDWARD CAMPBELL (Philadelphia, Pa.): I should like to present a modification of Foley's operation for correction of the stenotic ureteropelvic junction which I have used on occasion to enlarge the ureteral lumen and correct the pyelectasis. I believe a better end result is obtained if the pelvic capacity is decreased when a large hydronephrosis is present, for the urographic evidence of regression is more apparent than quantitatively real as proven by Sargent.

It is our practice to do the Foley Y ureteroplasty on the lateral surfaces of the ureter and pelvis rather than on the anterior or posterior surface. This is done with the object of not only increasing the size of the lumen, but to move the ureteropelvic orifice as close to the hilus as possible in order to obtain dependent drainage.

As you see in the diagram, a Y plasty is done on the outer ureteral surface and the inferior portion of the pelvis, if there is considerable distance between the hilus and the ureteropelvic junction. If the distance between the hilus and the ureteropelvic junction is short and there is a large redundant pyelectasis on the medial aspect of the pelvis the following procedure can be employed.

A heart-shaped piece of tissue is removed from the medial wall of the hydronephrotic sac. The apex of this excised tissue should be at the ureteropelvic junction and sufficient tissue should remain on the superior pelvic surface to permit a flap to be brought down to the lower end of an incision which is extended down the ureter for a distance of 2 centimeters from the apex of the pelvic incision.

The tip of the superior pelvic wall flap is then sutured to the ureter at the lower angle of the ureteral incision. The remaining openings on the anterior and posterior surfaces of the pelvis are closed with many carefully placed fine catgut sutures.

The slides which I show are illustrative of the type to which this procedure is adaptable and the excellent end result obtained.

DR. VINCENT J. O'CONOR (Closing): I would like to show a few more slides.

(Slide) Here is a girl who has painful hydronephrosis of the right side, and practically functionless hydronephrosis on the opposite side.

(Slide) This is the right kidney, before removal of the shell.

(Slide) This girl went home, and came back 2 years later. The left kidney has been removed. She had pain in her right kidney, and with that large pelvic stone, I told her that it should be removed surgically.

(Slide) She went home to get a baby-sitter. When she came back, another picture was taken, and the stone was at this point. She couldn't get a baby-sitter at that time so she went home again. When she had obtained the baby-sitter, she came back, and here (slide) was the stone, in the lower end of the right ureter. Following a couple of doses of prostigmine, the stone passed into the bladder and we removed it with cystoscopic forceps.

(Slide) This shows how her kidney looked a week after she passed the stone.

(Slide) This shows how an excretory urogram of her kidney looks, taken 2 years afterward. I think it is a rather striking case.

I would like to take this occasion to bring out a point which is in disagreement, from the adult point of view, with my very good friend, Meredith Campbell;

that is, I think that retrograde pyelography in large hydronephrotic kidneys is a very dangerous procedure, and especially if there is a low-grade infection. If you want to convert a possible pyeloplasty patient into a nephrectomy, one of the best ways to do it is to inject a large amount of opaque material. If you are going to have to do a retrograde pyelogram on these cases, I think you should have the patient prepared for surgery at a very early time.

I had a recent very upsetting experience of this kind, the third or fourth time it has happened to a patient of mine. A young man who worked in the business department at Northwestern University came in with a large hydronephrosis and a good functioning kidney on the right side. He was only 32 years of age. He had a normal kidney on the opposite side, fortunately. I had perfectly satisfactory excretion urograms, but my associate and a resident wanted a better picture of that kidney, so they took this patient down and did a retrograde right pyelogram, injecting about 60 or 70 cc of this new substance, 30 per cent urokon, in the kidney. The boy had no immediate reaction. He went home to get his affairs in shape to come back for pyeloplasty a couple of weeks later.

On the tenth day, he called me up early one morning to say that he had just experienced a very severe chill and a severe pain in his kidney. To make a long story short, he had suffered a spontaneous rupture of the kidney. I was called upon to do a very difficult nephrectomy 2 days later.

If I can possibly avoid it, in these large hydronephroses, I would rather not do a retrograde pyelogram.

I think Dr. Braasch brought out a very important point. I try to tell these people who have had pyeloplasties, especially those that have only one kidney left, that it is just as important for them to come back, either to me or some other urologist, every year for re-examination as it is if they had a papilloma of the bladder, because those patients may go on and very quietly lose the function of the kidney. I have seen a number of them who have been operated on elsewhere, who have moved to Chicago and who have come in with a high nonprotein nitrogen, a large hydronephrosis that probably could have been avoided if they had been repeatedly checked.

We do not feel now that resection of the pelvis is particularly important. We did a lot of resecting of tissue, and we found that it gives a better postoperative pyelogram, it looks a little prettier, but the patients seem to do just as well if you leave the pelvis alone and provide adequate drainage.

The caked kidney operation is very interesting. An Englishman has reported, I think, 45 such cases. Did you read his article, Dr. Dodson?

DR. DODSON: Yes, that is where I got the idea.

DR. O'CONOR: He had a good article on it, I think, in the *British Journal of Surgery*, about a year ago.

PRESIDENT COLSTON: I am sure I represent the feelings of the whole society when I thank the men who have made this symposium possible: Dr. Campbell, Dr. Deming, and Dr. O'Conor.

At this time, there is only one duty which remains to me, and that is a very pleasant one. First of all, I want to thank the members for their cooperation,

especially those who participated in the program and made it—I am prejudiced, of course, because of the great honor you have bestowed on me, but I believe that the men who participated in this program have made this meeting the most successful one of this society which I have ever attended.

And now, my only remaining duty is to ask Dr. George Smith and Dr. Braasch to induct the new president.

PRESIDENT-ELECT GRAVES: Dr. Colston and Gentlemen: I assure you that I feel at the same time both proud and very humble. I thank you for your confidence and for this very great honor.

There could not be a finer organization than this nor a finer group. I feel that it represents something unique and irreplaceable in American medical life. I want us all to strive hard and to be ever-vigilant to see that it is preserved in these changing times.

I promise you that I will do everything in my power in the coming year to maintain the great traditions of this Association. In that, I shall need your help and cooperation.

This has been an excellent meeting, and Dr. Colston, Dr. Heckel, and all those who have taken part in it are to be congratulated. These things don't just happen. They represent the full cooperation of all. We are going to try, but it will be difficult, to have a meeting equally as good next year. I hope that you all plan to attend. Preparations are already under way. I hope that our distinguished friends from other lands will plan to attend. I am going to ask each one of you to persuade the other members in your community to make every effort to be present at the next meeting.

And now, with my deepest thanks and my pledge for my best effort, I will ask if there is any further business to come before this meeting.